X

SUGGESTIONS

FOR

THE ADMINISTRATION OF THE FORESTS

IN

COORG.

BENGAL SECRETARIAT LIBRARY.

BY

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INTRODUCTION.

Since 1868, when Dr. (now Sir Dietrich) Brandis visited the Province, the forests of Coorg have not been specially inspected or reported upon by the Inspector-General of Forests. Dr. Schlich included Coorg in his list of Provinces to be visited in 1884-85, but so many calls were made on his time during that season that the visit had to be postponed. Since then Mr. Ribbentrop has been prevented by more important business from giving effect to Dr. Schlich's intention to inspect Coorg on an early date, and it has consequently been left to me, whilst officiating for Mr. Ribbentrop during his absence on furlough, to carry out the inspection in the season of 1889-90.

The Hunsur timber depôt, situated in Mysore territory, 28 miles from Mysore itself, was reached on the 15th January 1890, and on the following day a march of 18 miles brought my camp to Murkal, on the Coorg boundary and on the edge of the Hatgat reserve. Ten days were spent in an examination of the reserves along the eastern boundary and south of the Mercara-Fraserpet road. Four days were devoted to the Anekadu reserve and the other reserves to the north as far as Sandalkothi, and on the 31st January a march was made to Mercara. After halting there for three days, during which the Commissioner was consulted and the fuel plantation was inspected, camp was moved to Nalkanad, on the Ghâts, whence the cardamom mallés were visited. On the 7th February a march was made to Verajendrapet, and, after the Kutompolle plantation had been examined, Cannanore was reached on the 11th February. The inspection of the country from Mysore to Cannanore thus occupied 28 days. By the kind permission of the Chief Commissioner of the Central Provinces, where he had been serving for some few months, Mr. Dickinson, Deputy Conservator, who had been in charge of the Coorg Forests since 1876, was allowed to accompany me. His local knowledge and long experience proved of great assistance. Mr. McKee, Deputy Conservator at present in charge, accompanied me as far as Verajendrapet. He was prevented by illness, I regret, from going on to Kutompolle.

To Colonel Tredway Clarke, the Commissioner, I am indebted for much useful information regarding the various Forest questions in Coorg.

CHAPTER I.

THE FORESTS UNDER THE CONTROL OF THE DEPARTMENT.

a.—Area.

The area of forests under the control of the Department is—

	Square miles.
Reserves	241
Proposed reserves	7
Ghât forests (Protected)	303
Urudves, Paisaries, and Devarakadus (Protected)	308
	859

If the suggestions now made are accepted, the area of reserves may eventually reach—

	Square miles.
Deciduous forest	225
Evergreen forest	350
	575

b.—Classification of the Forests under the control of the Department.

The whole of the forests and waste land at the disposal of Government have been brought under the Forest Act (Act VII of 1878) either as reserved or protected forests. The former comprise for the most part the chief compact blocks of deciduous forest forming a more or less continuous belt along the eastern frontier; but they also include two groups of reserves in the evergreen forests of the Western Ghâts, where other areas too have been preliminarily proposed as Reserves. The protected forests include the compact tract known as the Ghât forests, as well as other scattered lands known as *Urudves*, *Paisaries*, and *Devarakadus*.

It may be explained that an *Urudve* is waste land at the disposal of Government, but over which the villagers are allowed to exercise, free of charge, certain rights of grazing and to unreserved trees.

Paisaries are unallotted waste lands absolutely at the disposal of Government.

Devarakadus are sacred groves or in some cases forests of considerable area, preserved by the people around their temples. So sacred are a few of them held to be that no one is allowed to enter them. This, however, is exceptional, for cases are on record where superstition has so far given way to private interests that the cultivation of coffee has been permitted in them. The Government has now interfered and checked this destruction of *Devarakadus*.

There is another class of, so to say, appropriated waste lands over which the Government retains certain rights. These are known as *Bane* lands, and are attached to *wargs* or permanent rice lands, for the use of the *Wargdars*, who may not dispose of the timber or forest produce from them.

c.—The Reserves, and further Reservation proposed.

In reviewing the Annual Report for 1887-88, the Government of India expressed a hope that all forest or waste lands whatsoever, that it was deemed expedient to maintain permanently for the supply of forest produce, should

be placed under chapter II of the Act as reserves. The Chief Commissioner has since communicated to the Supreme Government the view of the Commissioner that, except perhaps the Mercara fuel plantation and three smaller plantations, no tracts of land outside reserves already notified should be dealt with under chapter II; but he at the same time expressed a willingness to examine the question more closely, if desired. I had the opportunity of discussing the desirability of more extensive reservation with Colonel Clarke at Mercara, and he was not unwilling to reconsider the matter.

Paragraph 10 of No. 1329—1418, dated 28th August 1889.

When the reserves were first formed in 1870-71, they were so selected and demarcated as to exclude all lands over which the people could claim to have prescriptive rights, and of necessity considerable tracts of good forest land burdened with rights were in this way excluded from the limits. After the work of reservation was completed, the people complained that grazing lands had been included in the reserves, and on this an order was issued securing to the people any grazing rights that might have been affected by the reservation. Those rights, so allowed in a general way, have now been duly recorded by a Forest Settlement Officer, and they are the only legal obligations with which the reserves are burdened. Where the extension of existing reserves is found desirable—in order to include, for instance, specially valuable sandal or teak-growing lands, or to improve the boundary of the reserves, or to extend protection to the *Bane* or *Urudve* lands in view of an increased production of fuel and fodder—there seems to be no reason why both *Bane* and *Urudve* should not be brought under chapter II of the Act, provided all rights, to which the right-holders can establish their claims, be recorded in their favour. From the limited interest reserved by the Government in them, and their distribution in scattered plots—often at a distance from the reserves—it may, as a rule, be unnecessary to interfere with *Bane* lands. *Urudves*, on the other hand, are generally contiguous to the reserves, and composed of the same class of forest; and, as it is intended to maintain them permanently under forest for the benefit of the villagers, there will be every advantage in making them part of the reserves, with a view to their protection and suitable treatment. If left to suffer the destructive effect of the annual fires and general grazing without provision for closing them in rotation, their gradual deterioration is certain. Where *Paisaries* can with advantage be reserved, rather than allotted for the cultivation either of coffee or other crops, there can be no objection to such a measure; because, if they were applied for as coffee lands, they would be allotted without any admission of rights on the part of neighbouring villagers, and these can, therefore, have no claims over them such as could be held to preclude reservation.

The fuel plantation at Mercara may be reserved and extended as adjacent lands become available. The Gundagundi sandal plantation, with the Holegeri plots—though only 34 acres in extent—may with advantage be brought under the protection of chapter II. These are believed to be the plantations referred to by the Commissioner, and to the reservation of which he had no objection.

Other desirable extensions of reserves which came under my notice were:—

(*a*) An extension of Sandalkote reserve by some 40 acres of sandal-producing *Paisari*.

(*b*) The inclusion of the Mullur *Paisari* to the north of Ganagaur reserve for the production of sandal.

(*c*) The inclusion of the Kebbihola *Paisari* in the Nitida reserve for the planting of sandal.

(*d*) The addition to the Yedavanad forest of the *Paisari* and *Urudve* lands on the ridge and western slopes of Jenkalbetta, where the natural reproduction of sandal is magnificent.

(*e*) The reservation of the *Urudve* lands to the east of the Atturu and Anecadu reserves, where grazing is heavy; there is a considerable quantity of teak, and they are steadily deteriorating. The people have been allowed grazing rights inside the reserves, and, if these lands were included, the exercise of all rights could be systematically arranged for and the whole kept in perpetuity under forest.

(*f*) The extension of the Arikeri reserve by the inclusion of the Bambucadu resumed coffee estate, which is being planted with sandal, together with the intervening *Paisari*.

In the same way any other lands specially adapted for forest purposes as well as forest areas which, though burdened with rights, adjoin reserves and would consolidate them by a simplification of boundaries, should, in my opinion, be added to the reserved area, since such lands will ordinarily be maintained permanently as forests.

Besides the additional reservation recommended above, it seems desirable that the whole of the Ghât forests, bounded on the west by the limits of Malabar and on the east by a demarcated line, which are at present *Protected* and within which a settlement of the rights on the lines prescribed by chapter II of the Act is contemplated, should be once for all dealt with under chapter II and declared *Reserved*. The inquiry and record-of-rights, which may be made under chapter IV, but on the lines of chapter II only, will have no finality. Consequently when, at some future time, it may be decided to bring the areas so settled under chapter II, not only will the work have to be done over again, but new rights will have sprung up in the meantime and will probably have to be admitted. The reservation of the Ghât forests appears also to be called for with a view to prevent the annual firing of the grassy slopes, which are extensive on the east and occur in places on the west. The fire spreads from these into the many *sholas* (patches of tree growth in ravines), and not only prevents their extension, but markedly curtails them every year by killing the trees round their edges. The *jamma* cardamom *mallés*—that is, tracts over which people have acquired the right by inheritance to cultivate cardamoms, on payment of rental—would require to be demarcated, and the right in them might be recorded in the same way as has been done in the case of toungya cultivation within reserves in Burma: it would probably be unnecessary to exclude these *mallés* from the reserved area.

Coffee estates, even when situated in the midst of a reserved area, would, as a matter of course, be demarcated and excluded from the reserve.

Colonel Clarke is understood to desire that the position of the eastern boundary, as now laid down, should be considered at the time of settlement, and modified, if necessary, so as to throw out cultivable land where found along the edge of the tract. This would be done as a matter of course, the present line having been laid down without judicial inquiry in order to prevent the rapid destruction of *sholas* at the sources of streams, to give place to cultivation which was for the most part only temporary.

If the above recommendations are carried out, there will remain as Protected Forests under chapter IV—

(1) *Devarakadus*,
(2) *Urudves*,
(3) *Paisaries*.

The larger *Devarakadus* will have been included in the Ghât reserves. The smaller areas are sufficiently protected by the rules made under chapter IV of the Act.

A portion of the *Urudves* will be absorbed as reserves, and the smaller and more scattered areas must remain as protected forests until such time as, in the interest of a greater production of fuel and fodder, their stricter conservancy may be considered necessary.

The *Paisari* lands will gradually be allotted for cultivation or added to reserves.

A proposal has, I understand, been under consideration to form a special 'Fuel and Fodder' reserve of land conterminous with the Kattepura reserve, in accordance with the orders contained in Government of India Circular No.16A., dated 1st March 1883. As the reserved and protected forests cover 54 per cent. of the area of the Province, the formation of special fodder reserves is probably unnecessary in Coorg; but, if it is deemed advisable to extend special protection to any area adjoining an existing reserve, I would advise its being added to the reserved area, subject to such rights as may be found to affect it. The Chief Commissioner might then direct it to be treated with a view to the production of fuel or fodder, the satisfaction of the recorded rights constituting a first demand on its capabilities.

d.—General description of the Forests.

The deciduous forests form a more or less continuous belt running from north to south along the eastern limits of Coorg. They are more extensive towards the south, the belt in a northerly direction being more broken and made up of less compact blocks of forest. They cover gently sloping hills or undulating country, generally lying at 2,000 to 3,500 feet above sea-level. They grow on a soil resulting from the disintegration of granitic rocks, very varying in depth and richness of vegetable mould.

The marketable trees of these forests are—teak, sandal, *Pterocarpus Marsupium*, *Dalbergia latifolia*, *Terminalia tomentosa* and *paniculata*, *Lagerstræmia microcarpa*, and a few others of less importance. The forests to the north of the Mercara-Fraserpet road are generally dryer, and on poorer and shallower soil, than the forests to the south. Sandal is more plentiful in the northern forests, and the growth of teak and other important trees is less vigorous. In the southern forests teak and other trees attain to fine dimensions, but here again there is a marked difference between the forests on the eastern and western sides of the belt of reserves. On the east, where the rainfall is 30 to 35 inches a year and the soil was always somewhat inferior, the forests (first reached from the Mysore side) were originally more heavily worked. Once opened out, the regularly recurring fires and unregulated grazing have brought about a gradual deterioration of the soil, and reduced the forest to a state of incompleteness which contrasts in a striking manner with the forests 10 miles further west, where the rainfall is 10 to 15 inches more. In these, fires have been of rare occurrence, grazing has been slight or confined to the water-logged grassy blanks, and heavy fellings have not been made. As a consequence, the soil is loose, friable, and rich in loam; the stock is complete; bamboos (*B. arundinacea*) grow luxuriantly, and evergreen species become common. Teak is scarcely found, but the few specimens met with bear the mark of the favourable conditions under which they have grown up. In these west portions of the southern forests, sandal is not found growing naturally.

The evergreen forests are confined to the Western Ghâts, at an elevation of from less than 1,000 to 5,000 feet, where the rainfall varies from 130 to 180 inches a year. Although generally on a granitic soil, the lower portions are often on an over-lying laterite, which produces a very inferior soil.

The principal trees of any value at present are the *Calophyllum* sp., *Artocarpus hirsuta*, *Mesua ferrea*, and the forests are generally complete. The area of which the reservation is contemplated is by no means all stocked. At least one-third comprises grassy blanks, chiefly on the eastern slopes, with only patches of forest in the ravines.

The fuel plantation at Mercara, where the average annual rainfall is 127 inches, is situated at 4,200 feet, and, had it not been cleared and burnt over, would be naturally covered with an evergreen growth.

CHAPTER II.

Boundaries, Surveys, and Working-Plans.

a.—Boundaries.

Although the necessity for defining the boundaries of forest reserves by permanent marks has been several times pointed out by the Government of India, but limited progress has been made in this direction in Coorg up to the present. The lines have, however, been kept regularly cleared, and most of the old traverse stations are still to be found. Where the boundaries coincide with the limits of Mysore no further marks are required. Elsewhere Mr. Dickinson intended marking the angles with large quarried stones bearing serial numbers, but he found it impracticable to get these heavy stones carted to their sites, and it has now been decided to substitute stout posts bearing numbers, and a 10′ × 3′ × 3′ ditch, with a corresponding mound on either side indicating the direction of the line. Where the lines are long, intermediary ditches may be necessary, but they are not required at shorter intervals than half a mile. This plan is cheap, and answers very well in the plains or in undulating country. In the hills well-built cairns of dry stones will probably be found preferable. This work of permanently marking the boundaries should be completed without further delay, and the progress made each year be shown in the Annual Report.

b.—Surveys.

Contoured maps, on the scale of 4 inches = 1 mile, have been published of all the eastern reserves. These are sufficient for all present purposes, but the Rangers should be required to enter by chain and plane-table survey, on copies supplied to them for the purpose, the boundaries of plantations, all fire lines, roads, &c., and, in the case of the Hatgat-Nalkeri forests, the limits of the annual fellings. The Ghât forests have been included in the general 2 miles = 1 inch Madras Topographical Survey maps, and the eastern boundary line was traversed in 1882 and 1883 with a view to its insertion on this map. Up to date, however, this has not been done.

The remaining protected forests will be surveyed by the Revenue Survey party now at work.

c.—Working-Plans.

A working-plan has been sanctioned for the Hatgat-Nalkeri forests, and its provisions are now being carried out. It appears to be generally suitable, and I have only one modification of the plan to urge. The proposal, in the concluding clause of paragraph 57, to fell over the eastern zone of the Hatgat forest, treating it as 'coppice,' appears to me unsafe. The forest described as 'scrub' is an open park with only trees of miserably poor growth here and there; and although these ill-grown specimens might be replaced by a more promising growth of coppice shoots, I am strongly of opinion that the time has not yet come for such an operation. What is wanted is to protect the forest from the various causes which have brought it to its present unsatisfactory condition. These have been over-felling, fires, and grazing; and I would recommend that the compartments in the eastern zone of the Hatgat, as well as those similarly situated in the Nalkeri forest, and in which as yet no fellings under the plan have been made, should be carefully protected and given time to recover from

the ill-effects of past want of protection and treatment. They offer at present too unpromising a field to warrant expenditure on cultural operations.

Practically each forest has been divided into three separate working circles, in one of which operations should, I consider, be suspended during the term of the present working-plan.

In going over the forests, I was led to the conclusion that if the selection fellings and thinnings are carried out, as they ought to be, entirely with a view to the removal of deteriorating stock and to such improvement of the forests as sylvicultural requirements may impose, the estimated yield will not always be obtained; and this shows how necessary is the addition made to the plan, on the recommendation of Mr. Ribbentrop, which provides for the forest being gone over once only in 30 years irrespective of the outturn from the fellings.

Other working-plans are required for the Arikeri, Mawkal, Devammachi, and South Dubari forests, which supply the same market, at Hunsur, as the Nalkeri-Hatgat forests. These forests have yielded on an average, during the past five years, 550 logs a-year, of which 50 were teak, 300 *Pterocarpus Marsupium*, and 200 other woods. It will not be necessary at present to treat each of these forests as a separate working circle. They might at most form two; and no elaborate estimate of the yield is called for. The fellings can be regulated by area only, a rough estimate of the anticipated outturn being given. The felling of teak would be limited practically to dead and dying trees, and the removal of trees of other kinds would be well within the possible yield of the forests.

These working-plans should contain an accurate description* of the compartments, and should provide not only for the working of the timber, but for all necessary measures for protection from encroachment, fire, cattle, &c. They should also prescribe, besides thinnings, weedings, creeper cuttings, and all cultural operations the necessity for which can be foreseen.

Such plans should be drawn up for the Atturu, Yedavanad, and Dubari forests, which supply the depôt at Fraserpet; and also for the Ganagur, Jainkal, and Nitida forests, if they are to be worked for the supply of Arkalgôd.

The Anekadu forest, which also supplies Mercara with firewood as well as building material, probably requires a more elaborate working-plan; and it might be considered whether there is not an opening for working the Atturu Forest, from which 2,168 teak logs were extracted in 1888-89, more systematically in the interests of the Mercara supply.

Those portions of the evergreen Ghât forests which, from their situation near rafting streams or a main road, are being worked for a few kinds of timber only, should also, when the opportunity occurs, be examined and divided into compartments, which could be opened and closed to purchasers in rotation.

* The description of compartments of the Hatgat-Nalkeri drawn up by a Native Sub-Assistant Conservator leaves much to be desired. It should at least have been checked and re-written by the Working-Plans Officer.

CHAPTER III.

PROTECTION OF THE FORESTS.

a.—Establishments.

The forests are in charge of a Deputy Conservator, and the existing permanent forest and depôt establishment consists of 2 Rangers, 13 Foresters, and 73 Forest Guards. This is supplemented by a temporary establishment comprising 2 Rangers, 10 Foresters (including 3 writers for the Rangers), and 11 Guards; the entire cost amounts to R1,241 per mensem.

The establishment should be reorganised so as to bring the entire staff on to a permanent scale, which should be arranged so as to afford adequate prospects of promotion and thus render the service more popular. The salary of a permanent Ranger is at present fixed at R60, and both appointments are filled by certificated men from the Dehra Dun School, who naturally expect promotion on much the same scale as is attainable by certificated Rangers in other provinces. The temporary Rangers are paid at the rate of R40, which in a province where living is expensive is too low a rate to command for any lengthened period the services of men fit for the position. The majority of the Guards are paid at the rate of R7 per mensem, which is only about the pay of a coolie, and they have no prospects, as the Kurubar and Yarrawa are unable to read and write and cannot, therefore, be promoted to the class of Forester.

Some such revision as the following seems called for :—

PRESENT SCALE.

Permanent.

		R	R
	2 Rangers	at 60	120
13	2 Foresters	„ 30	
	5 „	„ 25	290
	3 „	„ 20	
	3 „	„ 15	
73	3 Guards	„ 10	
	6 „	„ 8	520
	58 „	„ 7	
	6 „	„ 6	

Temporary.

		R	R
	2 Rangers	at 40	80
10	3 Foresters	„ 20	
	3 „	„ 15	153
	4 „	„ 12	
11	1 Guard	„ 8	78
	10 „	„ 7	
			1,241

REVISED SCALE.

		R	R	R
1	Ranger	at	100	290
1	„	„	80	
1	„	„	60	
1	„	„	50	
1	Forester	„	40	410
1	„	„	35	
2	„	„	30	
4	„	„	25	
5	„	„	20	
5	„	„	*15	
3	Guards	„	10	689
10	„	„	9	
30	„	„	8	
47	„	„	7	
				1,389

* 4 Writers for the Range offices at R15 each have not been entered; they should be included in office establishment.

The Rangers' charges—*viz.*, North Coorg, South Coorg, Ghât Forests, and Kutompolle—as well as those of the 18 Foresters, were discussed with the local officers on the spot. The necessary number of Guards has been taken at Mr. McKee's estimate of requirements.

The permanent office establishment as sanctioned has been hitherto supplemented in several ways—(*a*) by a temporary clerk at R25 per mensem; (*b*) a Forester of the forest and depôt establishment employed as a second munshi; (*c*) a Forest Guard on R10 styled duffadar. These arrangements are irregular

and should be discontinued, and sanction obtained to a sufficient office establishment, which, with Rangers' writers, might be as follows:—

Existing.		Proposed	
Permanent.	R		R
Head Clerk	70	Head Clerk	70
2nd "	50	2nd "	50
3rd "	35	3rd "	35
1 Munshi	25	4th "	25
1 Jamadar (copyist)	12	1 Munshi	25
3 Peons at R8	24	1 Assistant munshi	20
1 Lascar	7	4 Rangers' munshis at R15	60
		4 Peons at R8	32
Temporary.			
1 Clerk	25	1 Lascar	7
	248		324

b.—General Protection.

Forest offences are few, with the exception of malicious injury to the forests by fire, which is seldom detected.

Cattle trespass is, generally speaking, rare, but few cattle being impounded; and the number of cases of theft of timber or forest produce is small.

Trespass in pursuit of game is commonly supposed to be connived at by the subordinates, and to this are ascribed many of the fires which have occurred in the reserves. Shooting, &c., has been prohibited since 1888, except by license, and licenses are usually not granted before May, when danger from fire is past. The fee, first fixed at R1, has since been raised to R5. It may be found advisable to further increase the fee to R10. But until the subordinates can be made to detect and report cases of illicit shooting, the amount of the license fee is a very secondary matter. If special licenses to hunt "rogue" elephants exempt persons from the obligation to take a license to shoot within reserves, this should be stated in the rule.

Rules are still required for the regulation of grazing, the right to which has been allowed by the Forest Settlement Officer within reserves.

The Ghât forests, within a demarcated line, and also all waste lands known as Urudves, Paisaries, and Devarakadus, are protected forests. These latter have been erroneously returned in the last Report as "unclassed State lands."

In all, 18 kinds of trees have been declared reserved. Sandal appears to have been omitted from the list under a misapprehension. It is now suggested that it be added, for otherwise it is liable to be treated as an unreserved tree and removed for house-building, &c. The prohibition (1) made by the Chief Commissioner in Notification No. 42, dated 20th September 1888, in regard to the felling of reserved trees, appears to be *ultra vires* and unnecessary in view of the provisions of section 32 (*a*) of Act VII of 1878. Prohibition (2), under the same notification, should have been made under section 31 (*a*). It seems to be somewhat inconsistent with Rule 1 and the rules for protected forests generally which follow it, which came into force on the 1st October 1888. It may be that the words "subject to existing rights" cover the felling or removal of unreserved trees for erecting huts for coolies or other buildings; but this is not clear, and, for the distinct understanding of the rules, existing rights should somewhere be enumerated.

c.—*Protection from Fire.*

It is a satisfactory feature in the Forest Administration of Coorg that fire protective measures, commenced on a small scale in 1876 and 1877 and considerably extended in 1878, have been applied for a number of years to all the deciduous reserved forests, except Alur (395 acres), and also to the teak plantations at Kutompolle, the fuel forest at Mercara, and to isolated sandal plantations. The evergreen reserves—*viz.*, Urti, Kerti, Chemboo, and Quinad—escape fire, as a rule, without special measures. It does sometimes happen, as was the case near Wattecolli last year, that a fire, after burning over an open grassy slope, is not checked by the evergreen forest and burns over a considerable wooded area; but such occurrences are exceptional. The burning of the grass-covered hills has no other object than to enable the Coorgs, the majority of whom have guns, to pursue game more easily: the grazing interests are here either insignificant or entirely absent. As the fires occasionally lead to a disastrous conflagration like that at Wattecolli, and invariably burn into the edges of the sholas and so curtail the wooded area, it is very desirable that the practice should be put a stop to. There ought to be no difficulty in preventing the fires if the Ghât forests are made reserves, as has been proposed elsewhere.

While the protection of almost all Reserves has been attempted, the system of fire-protection adopted for the Reserves liable to be burnt over has, however, as yet been attended with but qualified success, as may be gathered from the following tabular statement:—

Year.	Area attempted, in acres.	Failures, in acres.	Area actually protected, in acres.	Total cost.	Cost, in pies, per acre attempted.	Cost, in pies, per acre actually protected.	Percentage of failures over area attempted.
				R			
1884-85 . .	124,291	11,806	112,485	3,170	4·9	5·4	9·5
1885-86 . .	127,552	12,758	114,794	2,686	4·0	4·5	10·0
1886-87 . .	128,848	24,854	103,994	3,069	4·6	5·7	19·3
1887-88 . .	128,634	4,259	124,375	3,665	5·5	5·7	3·3
1888-89 . .	128,634	54,688	73,946	3,577	5·3	9·3	42·5
	Add cost during years prior to 1884 .			22,744			
		Total cost to date		38,911			

In ordinary years about 10 per cent. of the area attempted is usually burnt over, while in exceptionally unfavourable years 20 and even 42 per cent. of the total area is entered by fires. In a special year like 1887-88, when there was exceptional rain and an absence of high winds, only 3·3 per cent. of the area attempted was burnt over; but it must be noted that the exceptionally large area protected was due to the readiness with which fires were extinguished, and not to the preventive measures, for fires entered the protected areas on twenty-two occasions even in that year. In the previous year there were thirty-one different fires, and in 1888-89 no less than fifty-two.

These numerous fires are attributed to various causes, *viz.*—

(*a*) The deliberate setting fire to the forests (1) by people in pursuit of game; (2) by people who, interested in obtaining a better crop of grass, burn off the "lantana" and other undergrowth.

(*b*) The insufficiency of interior fire-lines.

(*c*) The carelessness and inefficiency of the subordinates.

With reference to (*a*), it may be observed that, as already noticed, the fee for licenses to shoot has been raised from R1 to R5, and that such licenses are not granted during the months of January to April. The subordinates are averse to giving evidence against their countrymen, and hence the enforcement of the rules is difficult; but the remedy appears to lie in bringing the subordinates to a better sense of their duties.

The people interested in grazing, as a rule, enjoy it of right, and, in order to remove the source of danger noted above, it only appears necessary to close a forest, which has been burnt over, to grazing on payment, and, under the last clause of section 25 of the Forest Act (VII of 1878), to suspend all rights for a period.

As regards (*b*), the system of fire-lines in force appears to be suitable and in most cases sufficient if properly and thoroughly carried out. It consists in clearing two parallel lines (one generally along the boundary line), 10 to15 feet broad and 100 to 250 feet apart, and in burning the grass between them.

Mr. Dickinson has already cleared some of the 15-feet lines to an additional breadth of 25 feet, in order that the grass may dry in them earlier, and allow of their being burnt before there is danger of fire spreading to the forest. This may be found useful. The same officer has concluded that the system now in force, though suitable for outer lines, is dangerous when applied to internal lines. On these he proposes to cut the grass over a single line 20 feet or 30 feet broad, allow the cut-grass to dry on the line and then burn. It may possibly be a better plan still to clear such a line of inflammable matter and to dispense with the burning, which is always liable to result in accidents. There are parts where the forest is dense, and the absence of grass and inflammable matter in quantity renders it extremely difficult to burn over a broad line between two previously prepared narrow lines, and here, I think, it would be sufficient if a 30-feet line were swept of leaves from either side towards the centre and there burnt.

The last cause of failure (*c*) is more difficult to deal with, as the sympathies of the subordinates lie to a great extent with the people who directly or indirectly originate the fires. The Commissioner recommended a system of awards, but the proposal in that shape was negatived by the Government of India. In my opinion, it is necessary to take some action in the direction indicated by the Commissioner, and, in making the following recommendation, I practically repeat the Commissioner's proposal in another form. In the beginning of this Chapter I have proposed to reorganise the establishment and place it on a better basis as regards pay and prospects. If this is done, promotion could be withheld and fines imposed where the men fail to do their duties. At present this is not possible with salaries fixed at practically the lowest limits. It is also very essential that the controlling officer should assume entire responsibility, and exact a due measure from his Rangers, who in turn would not fail to hold the Foresters responsible for the laxities of their Guards. I mean by this that the Ranger should not necessarily be exempted from blame because a fire occurred owing to some carelessness brought home to the Forester, or to a Guard absenting himself without leave. It is the Ranger's business to see that Foresters are painstaking in their work, and that subordinates do not absent themselves without leave; and unless he can do this (all allowance being made for the material he has to control and discipline) he is not fit for his post.

It is difficult to say whether the cost of fire conservancy in Coorg, which at present amounts to about six pies per acre actually protected, admits of reduction. For the present the aim must be to make it more effective. It may, however, be observed that, although labour is hard to obtain and costly compared with Central India for instance, only the eastern and south-eastern portions of the Reserves present special difficulties. To the north and in the western zones of the Halgat-Nalkeri forests the risk from fire is small, and the protection proportionately easy and cheap. On the whole, therefore, fire protective measures should eventually not be more costly in Coorg than elsewhere.

In Berar fire-protection costs two pies per acre actually protected, while in the Central Provinces it is a little over four pies per acre.

d.—Protection from Cattle.

Sheep are not reared in Coorg, and there are only a few goats which browse near the villages. Cattle chiefly and a few buffaloes only graze in the forests. Within the Reserves, rights to pasture have recently been settled; but the decisions of the Settlement Officer are in some instances still before the Appellate Court. Once these have been disposed of, it will be very necessary—particularly where considerable numbers of cattle, as in the Atturu and other Reserves, have been admitted—that suitable rules to regulate the exercise of the rights should be brought out; and as working-plans are framed, they should contain provisions by which the grazing rights are suitably arranged for and all the compartments of the forest closed for a period by turns. These rights are not sufficiently extensive to hamper the working of the forests, except possibly in the Atturu and Anekadu Reserves.

Free pasture has also to be provided, for a short period only, for some 1,500 Amrat Mahal cattle, and about 1,000 cattlewhich are the property of the Madras and Mysore Governments. As apparently it is not necessary to provide this pasture in any particular forest, it ought not to be difficult to relegate it to places or to portions of the forests where no serious harm can result. It is very essential that it should not be always allowed in the same tract of forest.

Where there is a demand for pasture on payment, and it can be provided without danger to the well-being of the forest, it may, as at present, be allowed. The working-plans should specify what areas must be closed and what may be opened during certain periods, and these must be treated in rotation. The ill-effects of continuous overgrazing are very apparent in the eastern zone of the Hatgat and Nalkeri Reserves, where it is understood the Amrat Mahal cattle have been regularly pastured for many years. Although it is true that these forests have also specially suffered from fires and other causes, there can be no doubt that grazing has, in no small measure, helped to bring about the present sterile condition of the soil and the incompleteness of the existing crop.

CHAPTER IV.

IMPROVEMENT OF THE FORESTS.

a.—Natural Reproduction and Cultural Operations.

Under protection the stock in the Eastern Reserves is becoming rapidly more complete, and the natural reproduction of, amongst other woods, such species as *Dalbergia latifolia*, *Pterocarpus Marsupium*, *Terminalias* and *Lagerstræmia microcarpa* is very marked. There is an absence of self-sown teak seedlings, old sandal trees are but rarely met with, and natural growth of young sandal within Reserves was only noticed to any considerable extent in the Nitida Reserve, though excellent young growth was found on the eastern slopes of the Jenkalbetta, outside the Reserve of that name. Sandal is found growing naturally in or near most of the Reserves north of the Fraserpet-Mercara road; and in these teak, though occasionally plentiful, is of much smaller dimensions than in the southern Reserves, parts of which are much moister than the forests to the north. As teak and sandal are the most valuable products in these forests,* the chief efforts of the Forester should be directed to increasing to the utmost the proportion of these species in the growing stock. So far this has been done almost exclusively by the formation of regular plantations. No cultural operations have been attempted in view of assisting the natural reproduction of sandal. Weedings by the killing of useless trees have benefited suppressed teak and aided the reproduction of other trees, but they have not resulted in any crop of natural teak seedlings. The dibbling in of teak seed where bamboos had seeded and died down has been tried for several years, but with poor results, and sowings in lines cleared through the forest have not been deemed sufficiently successful to be persevered in. From an examination of a small area in the Nalkeri forest, treated by the latter system and since allowed to grow up, it appeared that fair results had been obtained and a sufficiency of plants introduced. The failure of the dibblings in the Mawkal forest was traceable in one case to the non-weeding during the rainy season, and in the other to too late sowings. The area treated in the Dubari forest was found to contain a good number of seedlings, but these were very small; and the Ranger's statement, that the seed was dibbled in in May and the area weeded in July, is open to doubt.

The planting of teak in "kumri" land, on the teak "taungya" system as practised in Burma, has also been tried without success. Since then, however, conditions have changed and the Kurubars of the Betta and Jen classes, as well as the Yerrawas, who are the forest labourers and often live within the forests, have been deprived of all "kumri" cultivation and have been forced to cultivate low-lying grassy swamps given to them on easy terms,† with advances for the purchase of plough-cattle. They still have a strong leaning towards their old style of cultivation, and are specially anxious to obtain plots of land to "kumri", in which they can grow vegetables and crops other than rice. It seems feasible to induce them to accept almost any conditions in

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* Considerable sales of less remunerative woods, chiefly *Pterocarpus Marsupium*, *Dalbergia latifolia*, and *Terminalia tomentosa* and *paniculata*, are effected, but the prices realized are comparatively low; the natural reproduction of these kinds is good.

† Free to begin with, but subject to assessment after seven years. As the areas are limited and form part of the Reserves, and the people work for the Department, it would be a better arrangement to give up the idea of applying a land assessment, and to allow the tenure to be free of rent, but subject to renewal from year to year by order of the Forest Officer.

return for the privilege, and, under the circumstances, the experiment might at any rate be tried again and the men given a direct interest in the teak plants raised. They should be required to dibble in at stake in marked-out lines 9 feet apart and 4 feet between the stakes, and they might be paid at the rate of one rupee per 100 healthy plants counted in the cold season. The Karens in Burma, who thoroughly understand the business, lay down their teak seed at the commencement of the rains in beds several inches thick in suitable spots, and leave the seeds uncovered, watering, if necessary, till they begin to germinate and the outer shells split. The seeds are then picked out in this state day by day and planted by the women and children, with the result that scarcely a seed fails, and, the work being completed early, the plants by the end of the rains are strong and healthy and able to live through the ensuing hot season. This plan might advantageously be taught to the Kurubars.

The original cost of plantations made on this system, allowing for failures, is about R9 per acre, and the cost of weeding for three or four years would probably be R6 more. Thus the total cost per acre would be R15, as against R40 to R50 for regular plantations. The most suitable areas to begin upon will probably be the old "kumri" compartments, such as exist in the Nalkeri forest.

The sowing of teak in cleared lines, with intervening belts of forest, might also be given a further trial in teak-producing areas where teak is at present scarcely found, such as the Kuntur Kadu and other compartments in the western zone of the Nalkeri and Hatgat forests, where the few specimens of teak that do exist attain to magnificent dimensions. Sowing at stake with germinating seed will probably be found to answer better than transplanting delicate plants of a few weeks old from temporary nurseries. Such transplants establish themselves with difficulty during the rainy season, and have no strength to withstand the dry season.

The dibbling in of teak seed over blank areas, which need not necessarily be large, caused by the flowering and consequent dying down of the bamboo growth which covered them, should be steadily continued wherever the conditions admit of this being done. This is one of the most inexpensive methods of enriching the natural forest, and, provided the seed is put down early and the plants are tended, particularly in the first year, there is no reason why the operation should fail.

The present supply of sandal wood, coming as it does from village lands, cannot be maintained from this source; for, although some reproduction takes place in the lantana hedges, the young plants are greedily eaten by cattle and goats, and the people regard them with anything but favour. The Reserves and regular plantations only must be looked to for the supply of the future, and, as already stated, these Reserves contain very few old trees and but little young growth. The natural young growth of sandal in the Jenkalbetta, however, points to the conclusion that in the northern Reserves much may be done, by cheap cultural operations, to introduce sandal in quantity over large areas where fire-protection is assured and there is little or no grazing. In the Jenkalbetta there are scarcely any old trees, and the young growth appears to have sprung up under favourable conditions of soil and shade from seed dropped by birds. These conditions seem to prevail more or less over the hilly portion of Gangawara, the Ganaguru, Alur, Nitida, and Yedavanad Reserves, where not grazed over, and, if this is the case, the systematic dibbling in of sandal seeds would be followed by the best results. It should, therefore, be carefully tried on a sufficiently large scale, and, if successful, extended up to the limits of

supervision. The thorny undergrowth, which protects the seedlings from wild animals, should be carefully preserved. The fairly open condition of the forests appears to afford sufficient light for the growth of the plant in its early years, and, when a fair crop comes to be established, it may be necessary to set free the crowns of the sandal; but, for the present, no clearings of the natural forest are recommended.

b. (1)—*Regular Plantations.*

The plantations consist of teak, sandal, and fuel woods. They extend over an area of 1,348 acres, and, having been established under varied conditions throughout the Province, they are very instructive, as well as valuable. A complete list showing acreage, cost, and date of commencement, together with a detailed list of the cost and extent of the operations of the past four years, is given in Appendix C.

The Kutompolle, Karmad, Tittimatti, Maldare, and Anekadu teak plantations are all well stocked and of great promise. The Gangawara sandal plantation has been very successful since 1886, and parts of the Kargodu, Banawara, and other plantations are specially good. Each class may be considered separately, and it is proposed, though it may involve the repetition of some general principles of sylviculture, to profit by the experience gained by a study of the plantations in discussing at some length their past and future treatment. At the same time recommendations will be made for their extension or restriction.

Teak plantations.—The teak plantations aggregate 830 acres and are distributed as follows:—

		Acres.
I.	Kutompolle (Kerti)	453
II.	Amalle (Nalkeri)	17
III.	Irumani-Karmad (Hatgat)	197
IV.	Tittimatti (Mawkal)	24
V.	Maldare (S. Dubare)	18
VI.	Hanakodu Chirlikere (Dubare)	28
VII.	Karepura (Anekadu)	14
VIII.	Anekadu (Anekadu)	60
IX.	Huralikal (Atturu)	19

With the exception of Karepura, these plantations were all inspected, and the facts ascertained in regard to them are recorded in Appendix C.

Small plantings on bad soil in blanks of the Atturu Reserve, as well as a similar experiment in the Jenkal Reserve at Hirikere, call for no notice. They may be discontinued, as giving no practical results.

The teak plantations, debited, as they stand, with the failures of early years, have cost R97 per acre. But the cost of the extensions of the past four years has now come to be much reduced. Thus for an average yearly expenditure of R5,000, the older plantations have been weeded and maintained and 67 acres of new plantation added each year. This probably brings the initial cost of new work to R50 or R55 per acre. This is still somewhat high, but it has been explained that the high rate is due to the heavy cost of clearing the evergreen forest at Kutompolle, where the chief extensions are made, and to the Ranger and temporary establishment employed there being wholly charged to plantations, though they perform other duties, such as protecting a large stretch of Ghât forest and controlling the extraction of timber therefrom. These latter charges can be apportioned, and it may be accepted that in future the cost will not exceed R50 per acre, and R6 for weedings during the first three years, after which the charge for maintenance should be nominal.

In order to economise and facilitate supervision, operations should, if regular teak plantations are extended, be confined to as few points as possible. The Amallee, Karepura, and Huralikal plantations, to which there have been no recent additions, call for no special treatment beyond the cutting of creepers and the cutting back of such soft woods as may come to overtop the teak. Their extension is inadvisable. Of the Dubare plantations, Hanakodu has only to be protected from fire, while Chirlikere, the unsuccessful sandal area, has to be completed. In this latter, which has been long exposed and is thickly matted with grass, all growth not actually covering the leaders of the young teak should be encouraged. The areas upon which sandal has failed at Karmad and Maldare may also with advantage be stocked with teak. All these, however, are minor operations that a year or two will see completed.

The important question is—whether the regular plantations should be extended, and, if so, within what reserved areas?

Of the eastern Reserves, the Hatgat (Karmad plantation), the Devammachi (Tittimatti plantation), the South Dubare (Maldare plantation), and the Anekadu, all offer suitable sites, and the condition of the existing plantations promises well for the success of extensions.

But the fact that all these Reserves are not only teak-producing, but at present carry a considerable amount of naturally grown teak, points to the desirability of increasing the proportion of teak throughout the forests, rather than the production of it in pure plantations over a limited area. The forests are throughout easy of access, and from almost the entire area timber can be worked out on carts. Moreover, by the means of kumri plantation, an acre can be sufficiently stocked, wherever it is possible to adopt this method, for R15, as against R50 in a regular plantation; and areas where bamboos have died can be sufficiently restocked by dibbling at from R6 to R8 an acre. Under the circumstances, it seems preferable to restrict plantation work and devote additional energy to cultural operations.

It is suggested that no extension of teak plantations should for the present be made in the eastern forests, but that the cultural operations advocated elsewhere should be carried out in the Nalkeri-Hatgat, Arikeri, Devammachi, and Dubare forests. The Anekadu forest contains a good proportion of teak, though the trees are ill-shaped. The straight poles were removed, it is said, in thousands about 1870-72, under a contract, which also extended to Dubare, to remove inferior poles under 12 inches in diameter at six annas each. Under cover of this contract, young straight growth would seem to have been removed. This forest with protection only will improve and cultural operations are not urgently called for, unless it be in the southern portion, where teak is believed to be less plentifully represented.

In the evergreen forests, near the foot of the Ghâts, there is no teak, and its introduction can only be brought about by complete clearings. This work is too heavy for the kumri cultivator to undertake as a preliminary to his cultivation, and, once a clearing has been made by Government agency at considerable expense, it is advisable to restock it completely. The growth of the plantations, where they have been well planted, is very good, and with a compact block of 453 acres already established at Kutompolle, and the cost of planting reduced to R50 per acre, there is every encouragement to extend the plantation within such limits as can be thoroughly planted and tended. It should be feasible to restock 50 acres annually. The present system of clear felling and thoroughly burning must be continued. Nurseries are formed in March

and the seed is induced to germinate early by heavy waterings. The plants are put out in June and grow to 2½ feet to 3 feet the first year. No better result could be wished for, and all that is necessary is that the work should be carefully done. This is difficult with new and untaught coolies, the ground has to be gone over several times, and in the end the plantation is not always satisfactory. The plan of putting down germinating seeds, as recommended for the kumri plantations, might be tried. The planting would be better 9 feet × 4 feet than 6 feet × 6 feet, as the lines would be more easily followed. Once a full crop of vigorous yearling plants is established, such as grow at Kutompolle, there should be but little after expenditure. Creepers must be regularly cut, and the crowns of the teak must be kept free, but no such complete weeding out of all undergrowth as has been carried out should be continued. Pruning operations, which may be beneficial at Nilambur under a skilled operator, should scarcely be undertaken where this work is to be entrusted to coolies.

(2) *Sandal plantations.*—These, as recorded up to the close of the year 1888-89, are as follows :—

		Acres.
I.	Gangawara (Sandalkote)	121
II.	Kargodu (Malambi)	27
III.	Banawara (Nitida)	10
IV.	Herikere (Tainkal)	79
V.	Bakka (Atturu)	23
VI.	Huralikal („)	16
VII.	Gandadagundi (Fraserpet)	29
VIII.	Holégeri (Fraserpet)	5
IX.	Dubare (Bungalow)	2
X.	Maldare (South Dubare)	7
XI.	Balumari (Mawkal)	22
XII.	Bambookadu (Tittimatti)	25
XIII.	Karmad (Hatgat)	15
XIV.	Nagarholle (Nalkeri)	12
	TOTAL	393

The above-noted acreage does not include the additions made during 1889, nor a failure of two acres at Yerekolli (Anekadu) not visited.

The whole of the above plantations were visited and examined, and a full description of the existing plantations of sandal is given in Appendix B. At present the policy is to extend these plantations at the rate of 30 acres a year, and there can be no question as to their being a highly profitable investment; for the tree is estimated to reach a marketable size of 3 feet girth in 40 or 50 years, and a mature and complete crop would probably yield not less than 300 trees to the acre, containing at least 10 tons of saleable sandal wood worth, at present prices, R3,500 to R4,000. The estimated rate of growth is justified by the size of healthy trees of known age in the existing plantations, and the estimate of the number of trees per acre may be accepted. The only point regarding which there is insufficient information is the quantity of sandal wood per tree. The yield per tree extracted in past years has varied from $\frac{1}{20}$ to $\frac{1}{60}$ of a ton, but the trees exploited have come from village lands, and for the most part, at any rate in recent years, these trees are such as have died prematurely from isolation or ill-treatment. The plantation trees, at the size which it is estimated they will attain to, should not yield on an average less than a hundredweight of heart-wood, or half as much again as is assumed in the

estimates. Two trees were measured 4 feet 2 inches in girth, one of which had a stem 18 feet long and contained probably half a ton of heart-wood in root and stem.

The cost of the plantations has been about R90 per acre, and the 395 acres entered as stocked may be classified as follows :—

38	acres	fully stocked.	
66	„	stocked with	¾ crop.
169	„	„	⅔ „
71	„	„	½ „
19	„	„	¼ „
32	„	„	blank.

As might be expected, the outlay at the commencement of operations, when these were still in the experimental stage, was heavy and often resulted in failure. The recent plantations at Gangawara are now costing R45 per acre, including maintenance for the first three or four years, and it may be possible to even reduce this by extending and concentrating the area to be operated on and by restricting weedings. Hitherto there has been a tendency to treat the plantations too much like groves or gardens for the production of fruit, not wood. This has cost money, and is not the proper treatment for plantations destined to produce wood. In these the object should be to bring the soil into the best conditions of fertility by natural and, therefore, inexpensive means. This can be done by keeping it completely covered, and weeding should be limited to freeing the crowns of the sandal trees of any growth actually in contact with or suppressing them. The shade of trees with high cover is beneficial, and isolated trees should be carefully reserved, but not groups forming a complete canopy over considerable areas. In the same way, all growth which is not above the sandal trees should be fostered. It may be assumed that plantations can be created and maintained through the first years at R40 to R50 per acre, inclusive of fencing, which at Gangawara has not been a costly item owing to the situation of the plot necessitating a fence on one side only. Deer are exceedingly destructive to the plants in their first years, and some fencing will probably always be necessary.

With the favourable financial prospect already referred to, there is every encouragement to extend the cultivation of sandal, and the Department should aim at stocking 100 acres a year, at a cost of R5,000. The annual production of 100 acres would in due time reach 1,000 tons, a quantity which, as explained further on in this Report, it may be expected the market will readily absorb.

The extensions should be within the limits of reserved tracts, and the work should be confined to as few different places as is possible, in view of the difficulty of procuring a sufficiency of labour at the required seasons.

Of the fourteen existing sites, those at Dubare and Karmad have practically been given up. Five others have been stocked as far as they can be and are either incapable of, or unsuited for, extension. These are Gandadagundi, Holegeri, Maldare, Balumani, and Nagarholle. It is recommended that, for the present, work at Kargodu, Banawara, and Hirikere should be restricted to the completion of the areas now enclosed, the fences of which should be strictly kept in good order, and that further extensions should be deferred until the whole of the available land in the Gangawara Sandalkothi reserve has been planted up, which will probably be done in three years. It can then be decided whether Kargodu, Banawara, or Hirikere can be extended with most advantage. The cultural operations recommended in aid of natural reproduction will by that

time have had a fair trial. The following plantations should, it is considered, be extended in such proportions of the required 100 acres as may be found convenient:—

a. Gangawara (Sandalkothi reserve).
b. { Bakka / Hurlikal } Atturu reserve.
c. Bambookadu.

The sites at *a* and *b* are within the reserves, and the area at *c* consists of 150 acres of abandoned coffee estate which, by the acquisition of some 150 acres of waste land at present dividing it from the Arikeri Reserve, may be brought within reserved boundaries.

From the numerous experiments that have now been made under different conditions over a lengthened period, it is possible to lay down, with what seems to be a fair certainty of success, definite rules for the reproduction of sandal by artificial means.

The whole of the undergrowth, including trees with low cover and lantana, should be thoroughly cleared off the ground and burnt. The area to be treated should not be clean-felled, but as many trees with elevated cover as are conveniently situated, where they can be isolated, should be carefully kept. It may be objected that on several occasions this has been tried and failed, the plants having died off from excessive moisture. The failure, it is thought, was not so much due to the trees left standing, as to the weeds and undergrowth not being regularly kept down around the young plants during the rainy season, when their injurious effect would be increased by overhead shade. Partial clearings of the undergrowth or lantana, so as to imitate the conditions under which sandal plants spring up naturally by the sides of roads and in hedgerows, would at first sight appear sufficient. But experience goes to show that undergrowth and lantana, especially when so treated, grow with such luxuriance that they become uncontrollable and render the young sandal weedy, and eventually smother them. Under the circumstances, it seems imperative to make a thorough clearing and in this way give the sandal plants a year's start. Sowings with *dal* succeed so well that they may be preferred to the more expensive method of restocking by transplants. Instead, however, of sowing in continuous lines, which under favourable conditions result in too dense a young crop, it is recommended that the sowings be made at stake in well prepared pits (by this is meant cultivated patches 18 inches in diameter, slightly raised—not holes for the retention of surface water) 4 feet apart and laid out in lines 9 feet apart.

One of the chief conditions of success lies in the sowings being carried out early—that is, in May—and not dragged on till July and later. Unless the seed can be put in at the proper season, it is pure waste of money going on with the operation.

Throughout the first rainy season the young plants must be constantly weeded and cleared of all grass and close cover which is immediately over them. This early weeding cannot be too much insisted upon, and no more fatal mistake can be made than to neglect the young plants all through the rainy weather, and then, after the dry season has set in, to expose them to sun and drought by removing what at that time affords them a necessary protection. No weeding should be done from the close of one rainy season till the beginning of the next. Weedings must be steadily continued through the second and third years and even later; but, as the plants grow up, only such growth as is actually overtopping them should be removed.

For the replenishing of blanks either small nurseries may be made, or the sowings of the previous year may be indented upon for the required plants. The work of replenishing should be thoroughly done in the second year, and should seldom have to be repeated if the first sowings and weedings have been carefully carried out, unless, as is sometimes unfortunately the case, deer, rats, or other animals invade the plantation in numbers and eat up the plants. Rats are particularly destructive, burrowing under the lines and eating the fleshy roots over long lengths. Repairs should as a rule not be persevered in after the third year: natural blanks, and places that for some reason are unsuited to the growth of the tree, even if eventually stocked, rarely produce trees worth the money expended on them in repeatedly planting up. The plantation treated as recommended would, if successful, after a few years consist of three separate stages—the original high forest trees left for shade, the sandal trees, and below a growth of lantana and other undergrowth. For their maintenance and to secure a healthy growth of sandal trees, it will be necessary to guard against the shade trees closing in and forming a complete canopy, by girdling some of them from time to time; it will also be necessary to cut back the undergrowth or lower stage as may be required, in order to keep the crowns of the sandal trees free.

Fire will always be a source of danger, and too much stress cannot be laid on the necessity for effective protective measures; any economy that may be exercised in this direction at the cost of an accident will be much more than neutralized by the destruction of valuable plantations. Should a fire enter a plantation and plants be burnt down, it would seem to be advisable to grub up the burnt stems by the roots in the rainy season. This operation, which for various reasons* will probably be the method of extraction of the trees when exploited, results in a crop of vigorous root suckers, which, coming up in the lines, can be readily weeded and cared for.

This description of the sandal plantations and the suggestions with regard to their extension and their treatment have been arrived at on the ground in consultation with Mr. Dickinson, who has had the management of the existing plantations for twelve years, and with Mr. McKee, who is at present in charge of them. It has seemed desirable to treat the subject at length and in detail, so as to record what has already been done and afford guidance for future operations.

(3) *Fuel Plantation.*—This comprises 125 acres of waste land in several different plots near Mercara, which are planted with *Grevillea robusta*, *Casuarina equisetifolia*, *Cinchona succirubra*, *Cupressus torulosa*, &c. One plot of 24 acres adjoins the compound of a house and is isolated. Other two areas, of 60 and 40 acres respectively, are near together and connected by an area of some 70 acres not as yet planted, but protected. These three portions form an irregularly-shaped block, which may, at some time, be added to and made more regular. The cost of the plantation to date has been R10,948, but in this has been included much outlay on experimental cultivation and the introduction of exotics. *Grevilleas* are making good growth. *Casuarinas* are not doing well, but much natural tree growth is springing up. The reason that this latter does not more rapidly take possession of the soil, which not so long ago was under natural forest, in a climate like that of Mercara with a rainfall of 120 inches, lies in the fact that the hill-sides are covered with a dense growth

* The root is saleable as sandal wood, and reproduction by root suckers will probably obviate the necessity for sowing or planting a new crop to replace the old one.

of lantana, through which tree growth penetrates slowly, and which from its inflammable nature renders the regularly occurring jungle fires most destructive.

The yearly consumption of firewood in Mercara is put down at 6,000 cart-loads of 15 maunds each, or 90,000 maunds = a little over 3,000 tons. This is sold in Mercara at present in cart-loads at 5 maunds to the rupee, or in larger quantities at three annas a maund. The supply is derived roughly from the following sources:—

Five hundred cart-loads from *bané* (assigned waste lands attached to rice cultivation) brought in under license, for which a royalty of one anna a load is charged; 1,000 cart-loads from private estates; 4,000 cart-loads from the Anekadu Reserve and other places on payment of a royalty of 8 annas per load of cut wood, the felling being done departmentally; 500 cart-loads from various places, from which the fuel is brought in by head-loads.

It may be held that firewood at 5 maunds to the rupee is not dear. Moreover, since two-thirds of the quantity consumed come from distant reserves, where the resources are practically unlimited, present rates will not increase, nor will the supply fall off. It is urged, however, that firewood used to be cheaper, and there are advantages in keeping down the price of such a necessary as much as possible. This will not be attained by the creation of regular plantations, even at an initial cost of R30 per acre; for wood so produced could not, it is believed, be profitably delivered in Mercara at one rupee per 5 maunds, if debited with the cost of production and maintenance.

Should it be considered desirable to afford a supply of firewood nearer at hand than that now being drawn upon, the proper course seems to be for Government to carefully reserve and protect from fire (this is the essential point) any compact areas of waste land near Mercara that it may have at its disposal, or resume from Coffee Planters, and trust to the natural forest that will spring up on such lands at no cost beyond that of protection. There would seem to be no justification for an expensive artificial creation of fuel-supply, and small plots of a few acres can never be profitably dealt with. The present plantation must now be maintained, and the main portions of it should be extended (as has been already done by the addition of some 70 acres of waste land) by further reservation on the north-east and by the inclusion of any abandoned estates that may be adjacent. If other tracts of suitable size and shape become available within easy reach, these may be similarly treated and, as noted above, they *must* be protected from fire. Small plots, from the difficulty of protecting them, can only prove a useless source of expenditure. An area of 2,000 acres would probably, under proper treatment, supply all requirements in firewood other than those met from private or *bané* lands; and the reservation of this area within easy reach may be possible.

c.—Cutting of Creepers and Forest Weedings.

Attention has been paid to creeper cutting and weeding, both of which operations have been carried out systematically over large areas at very small cost. The weedings have been generally beneficial in assisting the growth of teak and other saleable trees. They have also been productive of a crop of young growth, especially in the more complete portions. In the dry and more open forests, with a deteriorated soil of which grass has got possession, weedings are, however, of doubtful utility. For the present, the aim should be to

obtain a complete canopy, and under the circumstances it is not necessary to be too exacting as to the quality of the material forming that canopy. It was remarked that in some cases the weedings had been made in fairly open places, in order to admit more light in the hope that teak would spring up; but the only result obtained was a larger break in the canopy, which was being gradually filled up by the same inferior growths that occupied the ground before the weeding. It seems necessary to first make sure of the crop of seedlings that it is desired to obtain by preparing the soil, dibbling in or other means, and then to make weedings with a view to their development.

d.—Communications and Buildings.

Communications.—The most important road is that from the Hatgat and Nalkeri forests to Hunsur. Its length from Hunsur to the edge of the forest is 18 miles, and 13 miles of this have to be kept up by the Department for the extraction of timber as well as a length of 12 miles from the edge of the forest to Nagarholle. This road is at present little better than an ordinary cart track, though some gravel has been spread on it, and it has been partially drained. An expenditure of R3,000 to R4,000 a year is necessary to put it in order, and provide for its maintenance for several years to come. If it is decided not to lay down a tramway, this road should be improved without delay, as on its condition depends the extraction of the possible yield of the forests. It should be raised and drained and gravelled where necessary.

The Minkolli road, by which firewood is carted from the Anekadu Forest to Mercara, should also be improved and made fit for traffic throughout the year. The eastern forests are generally accessible to carts, and fair-weather tracks are opened out without difficulty, as required, at little expense.

The Lachmantirt River, dividing the Arikeri and Hatgat forests, should be experimented with as a means of export from those forests. It contains a sufficiency of water in the dry season when the timber would be under easy control, and though blocked by an *anicut* (weir) this ought not to be an insuperable obstacle to floating. The Cauvery in the rains is a rapid torrent, in which timber set adrift cannot be readily collected, and in the dry season its broad expanses of shelving rock make it impracticable as a floating stream.

In the event of the Mysore Railway being extended to the Cubbany River, it may be profitable to open a depôt for Nalkeri wood at Antarsante or some other place on the banks of the Cubbany; but, before doing so, the advisability of entering into competition with Wynaad timber, along its natural line of export, should be fully weighed.

Buildings.—Cheap thatched huts have been put up in or near the forests, and these are most useful for the Rangers and subordinates throughout the year, and as affording temporary shelter for the Deputy Conservator in the hot weather or during the rains. At Kutompolle a better class of tiled resthouse exists. It cost R1,400 with out-houses, except stables, which are required. A similar house, but smaller, has been built at Kargodu for R700 or R800.

Accommodation is required at Nalkeri and Murkal in the Nalkeri and Hatgat forests, and also in the Anekadu Reserve. A house at Fraserpet appears also to be a desideratum. The Deputy Conservator has to live there for lengthened periods, to conduct his sandal wood sales and superintend the weighing of it afterwards. There is also a depôt for teak and other timber close by, and if sandal plantations are extended as proposed in the Atturu Reserve these

could also be supervised from Fraserpet. A well-built house with a large compound is said to be in the market at only the value of the material, which would be obtained by dismantling it. If this is the case, its acquisition by Government is worth consideration. The accommodation of the dâk bungalow is limited and liable to be all taken up by travellers.

CHAPTER V.

YIELD AND WORKING.

a.—The Markets.

Timber and Bamboos.

The deciduous forests are the chief sources of supply for the principal markets. The largest sales of timber and bamboos are effected at Hunsur in Mysore territory, whence the wood is carted to the railway line, 28 miles distant, and distributed to large centres of consumption such as Bangalore. The site of the depôt to the west of Hunsur is not well chosen, as it involves unnecessary haulage over 3 or 4 miles. The proper place for it would be about a mile east of Hunsur, where the main road would be reached by a direct prolongation of the road from Murkal, which would pass to the south of Hunsur. At Fraserpet, on the eastern boundary of Coorg, and at Arkalgod, in Mysore, sale depôts have also been established, and the timber from the latter, as well as some from the former, is consumed in Mysore. Beyond the timber consumed by the station of Mercara, the Coffee Planters, and the Public Works Department, there is practically no local demand. The people generally can satisfy all their requirements from their *bané* lands or from *Urudves*. A statement of the sales from depôts during the past five years is given as Appendix D. From this it will be seen that the sales and prices have averaged as follows :—

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	Teak logs and scantlings	Rate per ton.	Honné logs	Rate per ton.	Other logs.	Rate per ton.	Teak poles.		Other poles	
	Tons	R	Tons	R	Tons.	R	Number.	Each.	Number.	Each.
Hunsur . . .	571	47	183	37	185	20	912	8 annas	2,088	11 annas
Fraserpet . . .	73	33	114	27	82	17				
Mercara . . .	1½	36	23	26	12	20				
Arkalgodu . . .	3	30	12	30	16	21				
TOTAL .	648½	45	332	32	295	19				

Thus the average sales from depôts have represented in round numbers 650 tons of teak, 330 of Honné (*Pterocarpus Marsupium*), and 300 tons of other wood. There is also a demand from certain limited areas of the Ghât forests for poon, ironwood, &c., where a road or floating stream permits of the delivery of the wood on the western coast. From timber, inclusive of the revenue from poles and bamboos chiefly removed by purchasers, the receipts have been annually R47,000.

The markets have been much developed in the past thirteen years, the revenue from sales of timber and bamboos having averaged only R18,000 in the five years 1872-76.

Sandal wood.

The demand for sandal wood shows signs of rapidly increasing, and during the current year exceptionally high prices have been realised, notwithstanding the fact that the Mysore Government sold off 2,000 tons or considerably more than their annual outturn, which is believed to be about 1,200 tons. In the years 1872—77 the annual yield was 900 tons. The increased demand is due to its being more largely used in Europe in soap and perfume manufactories,

and there seems to be every prospect of the demand and prices being maintained.

b.—Yield of the Forests in Timber.

The possible yield of the deciduous forests, even in their present condition, is far in excess of present demands for teak, *honné*, *biti*, *matti*, and other woods, and one of the chief aims of the Department has been, and for some time to come must continue to be, to take advantage of every opportunity of disposing of timber in larger quantities. The average outturn for the past five years is given in Appendix E.

The evergreen forests, except where the few lines of export exist, are practically unworked, and where trees can be extracted a few kinds only are exploited.

The sandalwood-producing tracts, which at present contain mature trees, are all outside reserves and, as explained elsewhere, cannot be relied upon for any permanent supply. The estimated yield is placed at 60 tons a year for 17 years from 1886, but, since only dead and dying trees are removed, there is obviously no object in limiting the collections of wood which, if left, will deteriorate or be burnt.

c.—Exploitation : proposals for Working.

Timber.

Mr. Dickinson, with the object of working these forests up to the limit of their yield, has proposed to lay a tramway from the Nalkeri-Hatgat forests to Hunsur, by means of which he calculates that he will be able to deliver 2,674 tons of timber every year at the Hunsur depôt, besides poles, bamboos, and firewood; whilst, up to the time of submitting the project, he had never been able with carts to deliver more than 425 tons in any one year. He further claimed that by means of the tramway—

(1) large trees, which would otherwise remain in the forest, would be extracted and sold at considerable profit;

(2) longer logs would be extracted and sold at better prices than the short logs now taken out by carts;

(3) inferior wood would be extracted and sold at a profit, instead of being left to rot;

(4) extensive sales of firewood would be probable.

The Government of India, before passing orders on the scheme, asked for some assurance that the market would absorb, at remunerative prices, the material which it was proposed to throw on it; and I am not aware that the Chief Commissioner has submitted any further report on the question.

The sales at Hunsur have averaged under 1,000 tons a year during the past five years, and the highest figure reached was 1,577 tons in 1887-88. In 1888-89 they declined to 1,184 tons, and during the current year they have fallen off still more. The demand is influenced by the public works which may or may not be undertaken in Mysore. Sales have been reduced this year by some 200 tons, owing to the Kolar Mining Company having drawn their supplies from the Wynaad forests. The present decline in the demand is probably only temporary, for the transactions of past years clearly show a progressive improvement in the sales, though they have varied from year to year. The normal demand for 1,000 tons can be counted upon, and that demand may be expected to increase. In exceptional years even now 1,500 or 1,600 tons can be absorbed, but it seems clear that a quantity of 2,674 tons would ordinarily supply the

demand of two years, and that under the circumstances it would not be safe to reckon on disposing of such a quantity at once.

Although up to the time of the project being submitted only 425 tons had been extracted by cart, the quantity brought out by that means rose to 1,059 tons in 1887-88 and to 1,305 tons in 1888-89, and it would seem that with a better road there is but little limit to the number of cartmen procurable. The carts are exceptionally strong, and the bullocks are good. Instead of employing a contractor to supply the carts, who is at the same time interested in exporting coffee, in collecting manures, and is engaged with other works, it would probably be advantageous to place a Ranger in charge of the depôt at Hunsur and deal direct with the cartmen. His salary would only be about the equivalent to the commission paid to the agent, and he would be available for other duties.

It would be very difficult to extract trees of large girth in any satisfactory lengths, and probably such logs as are too big for the carts, one of which was found loaded with a log measuring 75 cubic feet, can best be treated by being sawn up in the forest.

Long lengths are doubtless in demand and fetch good prices, but long logs are not required to have special girth dimensions. If they can be obtained 40 feet long with a mean quarter girth of 1 foot 5 inches, that is cubing 84 feet, they meet all but very exceptional requirements.

Special timber carts, with high wheels to carry the log below the axle, might be tried where unusually large logs are to be brought out.

It is doubtful whether inferior wood or firewood in considerable quantity could be extracted and sold at a profit even by means of the tramway. The chief consumers of poles and cheap woods are the villagers, and they would, as a rule, prefer to go to the forest with their own carts and remove the wood by the most direct road to their villages. They would not, generally speaking, purchase at a sale depôt at a higher rate, even though it were nearer to their homes, and, as noted above, the Mining Companies are obtaining timber from the Wynaad forests. There are extensive forests lying between Hunsur and Nalkeri of an inferior class, but quite good enough to yield firewood, and with these it would be difficult to compete on satisfactory terms. It costs R1 per 100 cubic feet stacked to cut, collect, and deliver firewood from the Changa Manga forest to the railway line which skirts it. To carry this same quantity a further distance of 18 miles would probably cost not less than 14 annas, and depôt expenses may be estimated at 2 annas more. The present value of firewood at Hunsur is about R3-9 per 100 cubic feet or R3 per ton of 20 cwt., but the demand at this rate is very limited, and with increased supplies the price would fall.

The rates paid for cartage are :—

Logs containing 40 feet and below					.	.	. 3½	annas per foot.
,,	,,	more than 40 feet			.	.	. 4	,, ,,
,,	,,	,,	,,	60 feet	.	.	. 5	,, ,,
,,	,,	,,	,,	70 feet	.	.	. 6	,, ,,

and the average rate paid last year on 6,525 cubic feet was 3 annas 7½ pies.

The scale of rates is defective, in that it holds out insufficient inducement for the extraction of medium girth logs in long lengths. The rates should be revised so as to offer a premium for long lengths, independently of the cubic contents.

Presuming that the yield of the forests can eventually be worked out by carts, the present outturn being gradually increased as the market expands, the cost of extraction will only be reduced by the laying of the tram-line on the supposition that the poles, inferior woods, bamboos, and firewood, which it is proposed to extract, could be sold at remunerative prices; for the entire outturn in log, 133,700 cubic feet, could be delivered by cart at the current rate for R30,584, or at an enhanced rate of 4½ annas consequent on a revised scale, and finer timber for R37,603; while the annual cost of the tramway is estimated at R42,688. It must be allowed that the cart road will have to be further improved and maintained; but when it is considered that up to the end of 1888-89 only R2,647 had been expended on it, a sum of R3,000 to R4,000 per annum for the next few years should suffice for its maintenance and improvement.

The project for laying a tramway to Hunsur from the Hatgat-Nalkeri forests should not, therefore, be sanctioned at present, for the following reasons:—

(*a*) The market at Hunsur is not capable of absorbing at once the outturn, which alone would make the scheme financially successful.

(*b*) The quantity of timber that can be brought out by carts is yearly increasing, and by gradually expanding this means of export the rising demand, which is only gradual, will be fully supplied.

(*c*) With an improved road and suitable carts, logs of a size to meet all requirements can be brought out.

(*d*) Carts are a cheaper means of transport than a tramway when the possible yield of the forests is considered, unless inferior woods and firewood in quantity can be disposed of at Hunsur. Inferior woods will probably command a readier sale in the forests than at a sale depôt, and firewood is obtainable nearer to Hunsur.

(*e*) Possibly the Lachmantirt can be used as a floating stream.

If at any future time it be desirable to construct the line, the fact that its alignment runs through Mysore territory, and that the permission of that State will have to be obtained, should be remembered.

While the proposal has been under consideration, the market has fallen off. Further, the efforts made by Mr. Dickinson to improve the transport by cart have succeeded beyond his most sanguine expectations, and rendered inapplicable the chief argument in favour of the tramway. He is now the first to admit that the necessity for a special means of export, which was originally felt, no longer exists to the same extent.

At depôts other than Hunsur some 350 tons of timber are annually disposed of, of which one-fifth is teak, two-fifths are *honné*, and two-fifths woods of other kinds, chiefly *biti* and *mqtti*. The markets at these places are probably not capable of much immediate development, and the working-plans which, it has been already stated, should be prepared for the Arikeri, Mawkal, Dubare, Anekadu, Atturu, and other Reserves, will probably meet the demand, while providing for the removal of little more than dead or dying teak trees and trees of other kinds suppressing teak. The essential is to so arrange the improvement fellings to be carried out that, while operations are not unnecessarily spread over numerous different points each year, the forests will be gone over in systematic order, and the material be thrown on the different sale depôts with regularity and in such quantity as the demand warrants.

From the Reserves to these minor sale depôts cart tracks either lead direct or connect with the main roads, so that no special means of export have to be provided.

Those parts of the Ghât forests which are provided with lines of export should be examined and an estimate made of marketable trees of the kinds which command a sale, in view of their being made to yield an uninterrupted supply. They could possibly with advantage be divided into blocks, to which permit-holders would be admitted; but until more is known of their capabilities and of the markets on the western sea-board, nothing definite can be recommended in regard to them.

Sandal.

The exploitation of sandal must continue to be effected much on the same lines as at present. The sandal-producing area should be divided into blocks of more or less equal productiveness to be gone over in rotation, and the dead and dying trees collected and sold from a central *kothi*. The number of blocks and the rotation should be fixed, and the programme of work definitely laid out and sanctioned by the Chief Commissioner. At the sales during the ten years 1880-1889, 97 tons were disposed of on an average yearly. The prices obtained varied from R208 to R403 per ton of all classes, but as a rule the selling rate exceeds R300. It was R395 in 1888-89 and R389 in 1889-90. The cost of collecting, preparing for sale, weighing, &c., averages about R30 per ton.

Poles, inferior woods, firewood, and bamboos.

Both trees and poles of the inferior kinds can as at present be best disposed of by means of permits to purchasers, who will themselves cut and remove them from the forests. None of the better species of trees of any size should be felled except in the year's 'coupe', and after having been marked.

Cardamoms and other minor forest produce.

The income from minor forest produce, exclusive of that derived from cardamoms, is made up of—

	R
Honey and wax	1,000
Myrobalans	1,000
Soapnut	500

and a few other miscellaneous items.

Of the extensive Ghât forests, about one-third grows cardamoms, and the remaining two-thirds may be considered as half grass land and half forest not suited for cardamoms. The 64,000 acres, producing cardamoms in patches, comprise 15,000 or 16,000 acres which have been allotted under the rules in force for coffee land grants, and contribute to the land revenues a rental of R2 per acre. The *jamma mallés*—that is, tracts in which people established an hereditary right to cultivate cardamoms—cover some 3,000 acres, and the remaining 45,000 acres are given out on leases for 21 years. The *jamma mallés* were formerly held by people whom the Raja permitted to cultivate cardamoms on condition that they sold the produce to the State at a contract rate of R18 per Coorg maund of 28lb. It is said that, the price of cardamoms falling, the State was a loser by the arrangement, and the Raja then decided, rather than continue the contract, to let the cardamom growers have possession and dispose of their produce themselves. It has been put forward that the story was invented when the country was annexed; but, be that as it may, the prescriptive right has been allowed subject to assessment. Many of the *jamma mallés* are very productive, and it is thought that ordinarily an assessment of R3,000 a year would not press hardly on the

occupants. But at present the market price is as low as R25 per Coorg maund, while R80 is no uncommon price; it is not, therefore, advisable to interfere just now.

The leased *mallés* bring in about 8 annas an acre all round, but vary considerably, some of the best letting for more than R2 an acre. In a year when prices are low the lessees pay the rent with difficulty, and outstandings are unavoidable; but these are usually recoverable, because a certain prestige attaches to the holding of a *mallé* and it is not surrendered without a struggle. When the leases fall in, there is strong competition for them. During the past year, not only have prices been low, but the crop for want of early rain was very small. The method of cultivation involves but little labour beyond two excursions to the plots in the forest: the one to clear the soil, let in light, and weed around existing plants; the other to gather the crop. The cardamoms spring up naturally wherever the conditions favourable to their growth are produced. The present revenue of R23,000 a year will be maintained if prices take a turn for the better. War, it is said, at once creates an increased demand, but recent cultivation in Ceylon and larger supplies are not improbably accountable for the low rates recently ruling, which, however, are showing an upward tendency.

CHAPTER VI.

Financial Forecast.

The average Receipts and Charges, under main heads, for the past five years have been as follows :—

Receipts.	R	*Charges.*	R
		A.—	
I.—Timber and other produce, &c.	74,062	I.—Timber and other produce, &c.	24,210
II.—Timber and other produce, &c.	32,341	II.—Timber, &c. . . .	342
V.—Miscellaneous . .	6,621	VI.—Live-stock, &c. . .	1,183
		VII.—Communications and buildings . . .	2,278
		VIII.—Demarcation, improvement, &c.	16,139
		IX.—Miscellaneous . .	429
		Total A. .	44,581
		B.—Establishments, &c. .	29,326
TOTAL .	1,13,024	TOTAL .	73,907

showing a net income of R39,117 a year.

The main sources of revenue are (1) timber brought to depôt by departmental agency, (2) sandalwood, and (3) cardamoms, and the two latter are not capable of any development for some years to come. It is to timber, therefore, that the Department must look for increased receipts.

As yet only 1,280 tons a year are disposed of, while the Hatgat-Nalkeri Reserves alone can yield 2,674 tons, and the other Reserves considerably more than the 350 tons now sold from them. There is a prospect of the Hunsur demand absorbing the outturn of the Hatgat-Nalkeri forests, and of the sales being thus brought up to 3,000 tons a year, or 2½ times what they are at present. This would have the effect of increasing the gross revenue by some R70,000 and the net by R36,000, but this improvement can only be brought about gradually.

The following is a rough forecast of the anticipated average annual results of forest working in Coorg during the next five years:—

Budget Heads.	Total.
Revenue.	R
I.—Timber and other produce removed from the forests by Government agency—	
a. Timber	80,000
b. Firewood and charcoal	....
c. Bamboos	...
d. Sandalwood	24,000
e. Grass and other minor produce	...
Total	1,04,000
II.—Timber and other produce removed from the forests by consumers or purchasers—	
a. Timber	4,000
b. Firewood and charcoal	3,000
c. Bamboos	3,000
d. Grazing and fodder grass	1,500
e. Other minor produce	2,500
e. Cardamoms	23,000
Total	37,000
II.—Drift and waif wood, and confiscated forest produce	...
V.—Revenue from forests not managed by Government	...
V.—Miscellaneous	2,000
Average Annual Revenue	1,43,000

Budget Heads.	Total.
Expenditure.	R
A.—Conservancy and Works—	
I.—Timber and other produce removed from the forests by Government agency—	
a. Timber	34,000
b. Firewood and charcoal	...
c. Bamboos	...
d. Sandal wood	2,000
e. Grass and other minor produce	...
II.—Timber and other produce removed from the forests by consumers or purchasers	500
III.—Drift and waif wood, and confiscated forest produce	...
IV.—Revenue from forests not managed by Government	...
V.—Rent of leased forests and payments to shareholders in forests managed by Government	...
VI.—Live-stock, stores, tools and plant	1,000
VII.—Communications and buildings	5,000
VIII.—Demarcation, improvement, and extension of forests—	
a. Demarcation	1,000
b. Compensation for land and rights	...
c. Surveys and working-plans	1,500
d. Sowing and planting	11,000
e. Protection from fire	4,000
f. Other works	500
IX.—Miscellaneous	500
Total A.—Conservancy and Works	61,000
Total B.—Establishments	34,000
Average Annual Expenditure	95,000

It is anticipated that the trade in timber exploited by Government ageney will increase to such an extent that, although the receipts from sandal wood and cardamoms may remain stationary, any additional expenditure on the more rapid extension of sandal plantations, and on increased establishment organised on a better footing, may be more than covered. The net income will, it is expected, show an improvement on the average of past years, though it will fall somewhat short of the figures reached in 1887-88 and in 1888-89.

SIMLA,
11th August 1890.

H. C. HILL,
Offg. Inspector-Genl. of Forests.

APPENDIX A.

LIST OF TREES FOUND IN THE DECIDUOUS FORESTS OF COORG SOUTH OF THE MERCARA-FRASERPET ROAD.

USEFUL FOR TIMBER.

Teak—Tectona grandis.
Honné—Pterocarpus Marsupium.
Biti—Dalbergia latifolia.
Matti—Terminalia tomentosa.
Nandi—Lagerstrœmia microcarpa.
Arsantega—Adina cordifolia.
Kadiála—Stephegyne parviflora.
Ulwé—Terminalia paniculata.
Udi—Bignonia xylocarpa.
Dindiga—Anogeissus latifolia.
Alale—Terminalia Chebula.
Thadsal—Grewia tiliæfolia.
Jala—Shorea laccifera.
Betta honne—Ougeinia dalbergioides (on hill sides).
Noga—Cedrela Toona.
Nella goḍa—Garuga pinnata.
Sōme—Soymida febrifuga (near Murkhal, rare).
Goda—Odina Wodier.
Antwalla—Sapindus emarginatus.
Amti—Spondias mangifera.
Kanchwāla—Bauhinia purpurea.
„ — „ racemosa.
Nayibela—Acacia leucophlœa.
Bége—Albizzia Lebbek.
Bilẏara—Acacia odoratissima.
Hunasé—Tamarindus indicus.
Gandha—Santalum album (a few on the outskirts of the forests).

NOT USED FOR TIMBER.

Bende—Kydia calycina.
—Flacourtia sepiaria.
Buraga—Bombax malabaricum.
Kalsoge—Sterculia villosa.
Kouri—Helicteres Isora.
Goomchi—Eriolæna quinquelocularis.
Thadsal—Grewia oppositifolia.
Kokosma mulu—Zizyphus xylocarpa.
* Sagade—Schleichera trijuga.
Bandarike—Dodonæa viscosa.
Gera—Semecarpus anacardium.
Muruku—Buchanania latifolia.
Kéchige—Erythrina stricta.
„ — „ suberosa.
Pálwan— „ indica.
Honge—Pongamia glabra.
Mutuga—Butea frondosa.
Kakke—Cassia Fistula.
Mugli—Acacia Suma.
Shigekay—Acacia concinna.
Billi matti—Terminalia Arjuna (rare).
Táre— „ bellerica.
* Narale—Eugenia Jambolana.
Gawagilu—Careya arborea.
Battaga—Hymenodictyon excelsum.

* Timber might be used.

Karekaï—Randia dumetorum.
„ — „ uliginosa.
Bikki—Gardenia sp. (fruit eaten).
—Ardisia elliptica.
* Ippe—Bassia longifolia.
* „ — „ latifolia.
* Tupra—Diospyros exsculpta.
Balkunike— „ montana.
Hale—Holarrhena antidysenterica.
* Hádaga—Cordia Myxa.
Chole— „ Wallichii.
Bune Pále—Bignonia indica.
Mallalli—Stereospermum chelonoides.
Pádri— „ suaveolens.
Kalgante—Schrebera Swietenioides.
Nauládi—Vitex altissima.
* Kuli—Gmelina arborea.
Nelli—Phyllanthus Emblica.
Glochidion —sp.—.
Hulibi—Antidesma sp.
* Goje—Briedelia retusa.
Álada mara—Ficus bengalensis.
Arali— „ religiosa.
Goni— „ mysorensis.
Atti — „ glomerata.
Dwarf palm—Phœnix acaulis.
Hebbidaru—Bambusa arundinacea.
Kiribidara—Dendrocalamus strictus.

Besides most of the above, the following are found in North Coorg :—
Bél—Feronia Elephantum.
Bilpatre—Aægle Marmelos.
Karridi—Chickrassia tabularis (?).
Yelachi—Zizyphus Jujuba.
Gandha—Santalum album.
Cheninge—Lagerstrœmia parviflora.
Hillangi—Cascaria varians.
Kal mara—Homalium zeylanicum.
„ — „ travancoricum.
—Heptapleurum venulosum.
Bakkala—Mimusops Elengi.
Hole tupra—Diospyros Embryopteris.
Shadle—Olea —sp.—.
Garji—Carissa Carandas.
Kalakkai— „ Dalzellii.
Hále—Wrightia tinctoria.
„ — „ Wallichii.
Hulichellu—Mallotus philippinensis
Tapassi—Ulmus integrifolia.

TREES GROWING IN THE EVERGREEN FORESTS OF THE GHATS OF COORG.

Used for Timber.

Sampigé—Michelia Champaca.
Poon—Calophyllum elatum.
Átha—Mesua ferrea.
Bhíma—Pœciloneuron indicum.
Betta honne—Eurya —sp.—.
Urapu—Hopea odorata.
Kadgandha—Dysoxylon binectariferum (Bedd.).

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* Timber might be used.

Noga—Cedrela Toona.
Bellanji—Acrocarpus fraxinifolius.
Inul—Xylia dolabriformis.
Karri—Diospyros Ebenum.
„ — „ quæsita.
Neeli—Bischoffia javanica.
Halsu—Artocarpus integrifolia.
Hebhalsu— „ hirsuta.

TREES NOT USED FOR TIMBER.

Kanagala—Dillenia pentagyna.
—Wormia bracteata.
Kokkare—Scolopia crenata.
Niralata—Hydnocarpus inebrians.
Ponapuli—Garcinia Cambogia.
Divarike— „ sp. large ovate leaves.
„ — „ sp. obovate 3″—4″ leaves.
Káchampuli—Garcinia pictoria.
Nella mawu—Xanthochymus pictorius.
—Eurya Japonica
Yenne mara—Dipterocarpus lævis.
Im—Hopea parviflora.
Dupa—Vateria malabarica.
Buraga—Bombax malabaricum.
Tembadi—Sterculia fœtida (?).
Kume—Elæocarpus tuberculatus.
„ — „ oblongus.
„ — „ —sp.—
—Evodia triphylla.
—Zanthoxylum tetraspermum (climbing shrub).
Shettiga—Acronychia laurifolia.
Karri dupa—Canarium strictum.
Kaikolakadda—Heynea trijuga.
Helmara—Mappia fœtida.
Kumatti—Euphoria longana.
Kanji noga—Meliosma Arnottiana.
Metta— „ pungens.
Mawu—Mangifera Indica.
Kék—Holigarna, sp.
„ — „ longifolia.
Pálwán—Erythrina Indica.
—Cassia Roxburghii.
Hotebage—Albizzia stipulata.
Panerale—Eugenia montana.
Makkinerale—Eugenia hemisphærica.
Kadjamba nerale—Eugenia Codyensis.
Uddatale—Memecylon capitellatum.
„ — „ umbellatum.
—Heptapleurum venulosum.
Chendukare—Wendlandia Notoniana.
Amme—Plectronia didyma.
"Coorg Lilac"—Monosis Wightiana.
Holle nugu—Vaccinium nilgirensis.
Sankan—Symplocos Gardneriana.
Shadle—Olea —sp.—
Shibi—Ligustrum robustum.
—Alstonia scholaris.
Kotwallee—Tabernæmontana crispa.
Kasuragada—Strychnos Nux-vomica.
Bune Pále—Bignonia indica.
Nauladi—Vitex altissima.
Lakki— „ Negundo.

Lakki—Vitex leucoxylon.
Baswanpadu—Clerodendron infortunatum.
Ibbanne mara—Callicarpa lanata.
Netragane—Myristica laurifolia.
Dalchini—Cinnamomum zeylanicum.
" — " iners.
Tumbàle—Tetranthera sp.
—Phœbe "
—Litsæa zeylanica and several other Laurels.
Nirjanni—Glochidion nilgirensis.
Nayikuti—Antidesma Bunias.
Kukoti—Mallotus albus.
Upaligi—Macaranga tomentosa.
—Sarcococca saligna.
Goli—Ficus laccifera (?).
Aranji—Antiaris innoxia.
—Bœhmeria travancorica.
Screwpine—Pandanus graminifolius.
Bagani—Caryota urens.
Wild areca—Areca triandra.
Wild cocoanut—
Hebbidaru—Bambusa arundinacea.
Wottee—Melocanna humilis.

F. B. DICKINSON,
Deputy Conservator of Forests.

APPENDIX B.

HISTORY OF PLANTATIONS.

Teak Plantations.

I.—Kutompolle (Kerti).—453 acres.

Is situated in the Kerti Reserve at the bottom of the Perambadi Ghat at 500 to 1,000 feet above sea level. The soil is either a red clay covered with a thin layer of vegetable mould or a hard laterite soil. It slopes generally to the west, and the gradients are in parts steep. *Former vegetation*—evergreen *Calophyllum*, white cedar, dammers, *Dipterocarpus*, *Xylia*, &c.

Temperature—From 80° to 105° in the shade.

Rainfall—About 160 inches.

A river by which timber is floated to the coast flows at the bottom of the plantation. In 1868 a small experimental area was planted up. In 1870 an area of about 100 acres was cleared, leaving a good many large trees, and planted with 70,000 plants. The plants were said to have done well in the open portions, but to have failed under the cover of the large trees. In 1871 an area of 41 acres was planted with 29,210 seedlings, of which about three-fourths succeeded. In 1872 about 30 acres were planted. In 1873 the nursery was made too late and plants were brought from Karmad, with which 18 acres were planted. *Calophyllum* and *Mesua* plants were also brought from the jungle, but they died off. In 1874 the nursery again failed and seed was sown *in situ*. *Calophyllum* and *Mesua* plants were again tried, but died out. During 1875 the previous years' planting was weeded. Nothing was done from 1876 till 1882, in which latter year a plot of 35 acres was cleared and planted in the following monsoon, and the area of the old plantations stocked was taken as 34 acres.

During 1883 an addition of 37 acres was made. This was planted without making pits, as the digging of pits was found to set up wash. Instead of a pit, a small hole was made with a crowbar and the seedling planted in it.

During 1884 a clearing of 125 acres was successfully planted.

In 1885 a clearing of 30 acres was half planted and half sown at stake; the latter operation was not successful.

In 1886 a new clearing of 50 acres, the portion incompletely stocked last year, and an area of 32 acres originally planted by a former contractor with Liberian coffee, were planted. In 1887 an area measuring 70 acres, between 1886's bit and that of 1884, was treated. Much of this is on laterite and did not succeed well. In burning this clearing, fire entered the plantation of 1884 in spite of all precautions, and a considerable portion of the plantations of 1882, 1883, and 1884 was burnt through.

During 1888 an extension of 30 acres was made. Owing to the incomplete success in 1886 and 1887, weeding in those areas is expensive, but the older plots stocked previous to 1885 now cost very little.

Of late years, caterpillars have been troublesome and have done much damage by eating off the leaves of the plants and even the young shoots.

The trees planted in 1868, and which measured 35 feet in 1875, have been lost sight of. A few trees, very favourably situated between the river and the main road, may be representatives of that period. They measure 50 feet, with girths of 2 feet 8 inches, 2 feet 10 inches, and 3 feet. The oldest plantations made from 1870 to 1872, estimated at 34 acres stocked, were originally entered as 152 acres costing R5,192 in 1872-73. These were neglected and allowed to become overgrown for some years, until in 1879 it was not thought worthwhile to do anything. In 1880 the area was written back from 152 to 50 acres without any explanation, and two years later it was weeded: by this time the cost had reached R8,000. Since then they have been cleared about every second year of creepers, &c., and in 1889 the trees were badly pruned—an operation which, if properly carried out, would have been of doubtful benefit, and as actually done is most deleterious. The best trees measure 45 feet and 48 feet in total height, and girth 2 feet 2 inches, 2 feet 10 inches, and a few even 3 feet. It should not be subjected to any further clearings or weedings, except of creepers. All undergrowth should be carefully preserved and encouraged. The 1882 and 1883 plantations, though fully stocked, are not doing well. They were overweeded for a time, have been unnecessarily pruned, and caterpillars have eaten them back. They have an average height of about 28 to 30 feet—a portion of 1882 is

40 feet—and the girths of the dominant trees vary between the following measurements:—1 foot, 1 foot 3 inches, 1 foot 4 inches, 1 foot 5 inches, and 1 foot 10 inches.

The really successful portion of the plantation is the area of 125 acres planted up in 1884. This is everywhere well stocked and growing under favourable conditions. It varies much from the tops of the ridges to the sheltered bays, but generally its height is from 27 to 35 feet, and it contains many trees 15 inches in girth. This for six years is very good. Undergrowth should be encouraged, and creepers only cut.

The plantation of 1885, over the half which succeeded during the first year, is fairly good, the plants having a height of 25 feet with a girth of 9 inches. The portion which failed to begin with has only been replenished by degrees, and is now beginning to make a show.

The plantation of 1886 is the most westerly portion; on a laterite soil and badly planted to begin with, it is not progressing favourably. The plantings of 1887, 1888 and 1889 have also been badly done; in the two last years there was an inexcusable insufficiency of seed and plants. Weedings have not been judiciously carried out; but where the original plants were sufficient, they have survived and will form a complete stock.

Young plants grow very rapidly, attaining to 2 feet and 3 feet the first year; and if an area is properly stocked at the outset, it grows luxuriantly and gives but little trouble beyond that of cutting creepers.

Granite rock with good soil, but little vegetable matter, is general; but laterite outcrops here and there. In extensions, laterite should be avoided as far as possible.

The soil and climate appear to resemble that of Nilambur, except that the latter is lower down and comes more within the alluvial zone.

The cost to date for the area now entered as 453 acres has been R42,595.

II.—Amalle (Nalkeri).—17 acres.

In 1879 an area of 30 acres north of the river was treated by dibbling in seed, which did not germinate.

The next year the same area was treated by cutting strips 12 feet broad through it, and restocking the strips partly by plants and partly by sowing. The result was not very good.

In 1882 a plot south of the river was similarly treated, but with a poor result, which may have been partly due to bad work; and in 1883 this area was clear felled and planted, but the planting was not complete, owing to the grass having taken possession of the soil after the partial clearing in the previous year.

In 1884, 4 acres cleared, but not planted, the previous year were planted up, but the growth of grass was very thick and stifled the young plants.

Since 1884 the plantation has been weeded twice every year and twice supplied with plants. These clean weedings have been detrimental to the growth, which is poor, and the cutting out at the end of the rains of all grass and undergrowth level with the soil has apparently led to the main shoot of the year being regularly killed back and to the trees generally becoming hide-bound. Either no further weedings should be made, or they should be restricted to the cutting back of noxious growth sufficiently only to clear the heads of the teak. The cost of these 17 acres, with other experiments, has been R2,272.

III.—Karmad-Irumani (Hatgat).—197 acres.

Is situated in the western zone of the Hatgat forest, in which there is very little naturally-grown teak, but good high forest of *Pterocarpus*, *Dalbergia*, *Lagerstrœmia*, and *Terminalia* interspersed with bamboo (*B. arundinacea*). The soil is a good deep brown loam.

Planting was commenced in 1868 over 3 acres. In 1869, 50 acres were planted at intervals of 6 feet in trenches dug 10 feet apart in partial shade. In 1870, 80 acres were added, the plants being planted in pits still under partial shade. To the end of 1870 the plantation had cost R5,013 for 133 acres. During 1871 a further extension of 50 acres was planted and resulted in a 50 per cent. success; a portion of the plantation was burnt in this year. In 1872 a clearing of 20 acres was made and partly planted and completed in 1873. In 1874 an extension of 25 acres was made, and in 1875 a further extension of 15 acres. Since 1875 no extensions have been made. The last three plantings were not quite a success. The plantation was surveyed and its area returned as 189 acres, the expenditure on which had been R15,755. The incomplete stock and the heavy growth of weeds necessitated costly weedings up to this time. Fire again entered the plantation in 1880, but did not do any permanent damage. A thinning was made in the 1869 portion in 1886.

The average size of the older plantation now varies somewhat as follows:—

40 feet in height with the dominant trees	1′ 6″	in girth.
45 " " " " "	2′ 2″	"
50 " " " " "	2′ 10″	"

Exceptional trees measure 3 feet, 3 feet 2 ½ inches, and 3 feet 10 inches in girth with fair length of stem.

The girth measurements are better than those of plantations of the same age at Nilambur; but the height compares unfavourably, it being 65 and 70 feet at Nilambur, or 20 feet more.

The southern portion is not complete, but there is a sufficiency of teak, and ten years hence the whole will have an appearance of completeness. The fully-stocked area of the older plantation is estimated at 50 acres. The trees of the future are already clearly marked out and the plantation is growing vigorously.

A small area of 8 acres was planted in 1882 at *Irumani* near Karmad. In the complete portion of this the trees, now eight years old, measure 28 feet in height with girths of 12 to 15 inches.

The greater part of the plot carries only an incomplete crop, and has been overweeded. The young trees are branching, their leaders having several times died back. Fire passed through the plantation in 1889, and trees that were killed back have sent up coppice shoots 12 feet in height. The ill-shaped young trees not killed might have been cut back with advantage.

IV.—Tittimatti (Mawkal).—24 acres.

Situated in the Balumani compartment of the Mawkal Reserve, was commenced by the planting up of about 10 acres in 1868 and 1869 under partial shade; but, the experiment not being encouraging, no further extensions were made till 1883, when 24 acres were felled to the north of the old plantation and 6 acres planted at 6 feet apart; the remaining 18 acres were similarly planted in 1884. During the monsoon of 1885 the plantation was not well weeded and the young plants were kept back by the weeds. In 1887 fire passed through the plantation and the strong regrowth of coppice shoots got ahead of the weeding. During the monsoons of 1887, 1888, and 1889 the plantation was overweeded. This area of 24 acres is now well stocked, and the utmost that should now be done by way of weeding is the lopping of soft woods if they come to overtop the teak. The original 10 acres have been written off as a failure; the site was badly chosen and the plantation had no chance of success on such a soil, where the only natural growth is the stunted *Terminalia* usually found on inferior ill-drained soils.

V.—Maldare (South Dubare).—18 acres.

Exclusive of 8 acres of the sandal plantation recently replenished with teak, the area is 10 acres, of which 5 were planted in 1883 and 5 in 1884. In 1885 the area was replenished and weeded, and since that time it has been weeded every year. This plantation cost originally R45 per acre, and weedings have now brought the cost to more than R100. These weedings have been unnecessary, if not harmful, for some time; and the mutilation carried out by the Forester all over the plantation under the name of "pruning," with the idea apparently of preparing the plantation for the visit of the Inspector General, was simply a disgraceful operation.

VI.—Hanakodu-Chirlikere (Dubare).—28 acres.

Consist of 28 acres, ten of which were treated in 1881 and 1882 by planting in belts with forest intervening. This operation not succeeding, the area was clean-felled and planted up in 1883 at a cost of R341. This, known as Hanakodu, was very complete; but fire passed through it in 1889, doing great damage. The larger trees have been much injured and forced into clusters of branches. The younger trees killed right back have coppiced vigorously, and it might have been useful to have cut back the larger ones flush with the ground. The fire happened most inopportunely just when many of the plants were too large to be killed right back, and too early for the plantation to have sufficiently closed up to kill out the grass. The remaining 18 acres represent recent plantings in the Chirlikere plot, and near the bungalow, where sandal was originally raised and afterwards destroyed completely by wild animals.

VII.—Karepura (Anekadu).—14 acres.

Was made on the right bank of the Chicklihole (river) within the Anekadu Reserve. Commenced in 1873, 20 acres were planted at a cost of R1,050; but, not being considered successful, no extension was made. Some 14 acres are considered to be stocked, but, consequent on the site being insufficiently drained, they are said to make but little growth.

VIII.—Anekadu.—60 acres.

More recent plantations in the Anekadu Reserve cover 40 and 20 acres. The former was treated by dibbling in seed in alternate cleared belts in 1880 and 1881. It was afterwards cleared completely and planted in 1883 and 1884. It has been twice burnt over, and shows but moderate growth; but is fully stocked, and, if protected from fire and not overweeded, will doubtless rapidly improve.

From 1885 to 1888, 20 acres have been planted up near the main road. The plants are looking healthy, and there is a sufficiency of them. The expenditure on the 60 acres has been R3,706, or more than R60 per acre.

IX.—Huralikal (Atturu).—19 acres.

It was planted with teak in 1882, with fair success, except on the southern side, in which seed was sown at stake, there being insufficient plants available. This portion had to be planted in the following year, but failed and it was again replenished in 1885. In successive years the plantation has been weeded at considerable expense, the thick lantana growth, it is said, making the weedings costly. It is doubtful if these weedings were necessary, as the plantation was very complete until gutted by fire in 1889.

SANDAL PLANTATIONS.

I.—Gangawara.—121 acres.

Is the largest and most important; it is situated within a reserved area on the eastern boundary and near the northern limits of the Province. Cultural operations were commenced as far back as 1872, with the dibbling in of seed over 5 acres from which only the undergrowth was cleared, and in the following year 10 acres were similarly treated. For three years no extension was made; unsuccessful sowings were repeated over the 15 acres. In 1877 prepared pits were made over 13 acres and sown, and nurseries for raising plants were established. During the next year blanks were treated by further sowings and the introduction of some transplants, and a further area of 10 acres was sown up in pits, but the seed germinated only in about one-fifth of the area. During 1879 no new area was treated, but the entire plantation was repaired with sowings and transplants. *Dal* was sown with the sandal seed in the more open places. Up to this date the plantation had cost R2,893, and 25 acres were said to contain about a twentieth of a complete stock.

In 1880, 15 acres were clean felled, burnt over, and treated partly with plants from the nursery put out in prepared pits, and partly with lines of sowings of mixed *dal* and sandal seed; but the operations were not completed sufficiently early in the rainy season, and only the first plantings succeeded, while the sowings came up fairly.

In 1881, a further area of 12 acres was planted up after being entirely cleared. In 1882-83, the original 25 acres were cleared and sown in lines, as well as two new plots of 19 acres. The result was only satisfactory in the new area. In 1883 a new clearing of 5 acres was sown in lines, and seed was sown in pits over the old area. Shade-giving natural growth was encouraged.

In 1884 a clearing of 10 acres was sown in lines.

So far the area treated—corrected to 80 acres—had cost R8,231, and but qualified success had been attained. Even now, although the area has been constantly gone over and blanks supplied with plants, the area is for the most part incompletely stocked, and the trees show but moderate growth. The site was not well chosen, its drainage, especially in the eastern portion, is defective, and the natural forest would seem to have contained grassy blanks and glades, into which the introduction of a delicate plant like sandal is an almost impossible task. Such blanks, clearly marked out as unsuited for tree growth, should not have been persevered with. The desire to make the plantation complete has led to futile expenditure in repairs, and has necessitated constant and thorough weedings in the interest of newly put out transplants, which were actually detrimental to the healthy development of the established plants, several years old. The largest trees are 12 feet high and girth from 8 to 10 inches. The area taken as a whole carries about two-thirds of a complete crop.

In 1885 the plantation was extended by 10 acres, 5 or 6 of which were on the higher ground to the west, and these mark the first real success achieved in the plantation. They were sown in lines 8 feet apart and are completely stocked, the plants having been thinned out to 4 feet apart. The growth of the dominant trees is equal to that of the best specimens in the older plantation.

From 1886 to 1888 the plantation was gradually extended up the slope to the west, over a total area of 31 acres. During the first year sowings in lines only were practised, and for two years a part of the area was planted up with transplants taken from the lines of the previous year. The entire area is well stocked with healthy plants (except where monkeys carried off the seed in 1888-89, and some repairs have to be done) showing excellent growth. Four-year old plants vary up to 10 feet in height, and average over dominant trees about eight feet.

The sowings of the past rains have also succeeded, the plants along the lines are 9 inches high and as thick as need be in nursery drills. The planted pits have also been sown with sandal and *dal*, and, as a rule, both the transplant and the seedlings are growing.

The average expenditure for the past four years has been R846, and, allowing R5 per acre for maintenance and repairs of the 80-acre plot, the recently added 41 acres have cost R416 (including maintenance and weedings, which will scarcely be required for the older portion in future). This brings the cost per acre to R45, exclusive of fire-protection and inclusive of the first few years' upkeep.

II.—Kargodu (Malambi).—27 acres.

Is situated on the northern edge of the Malambi Reserve. It was commenced in 1880 by sowings in lines over two and extended by two acres in each of the two following years. In 1883 sowings were extended over 4 acres and the older part was replenished. In the following year 2 acres were stocked, making a total of 12 acres at a cost of R879. For two years no addition was made; maintenance and repairs cost, respectively, R4 and R7-8 per acre. The area is fairly well stocked, but the growth is generally poor. It was practically clean-felled and has been too thoroughly weeded, all natural forest growth having been cut out close to the ground.

In 1887 an extension of 7 acres was made, and this is completely stocked and growing well, though the lines in places contain far too many plants. Further areas of 8 and 16 acres have been since treated in 1888 and in 1889, partly by sowings in lines and partly by transplantings from the lines of the previous year. The sowings were successful, but the planting appears to have been carelessly done, and both have been insufficiently weeded or weeded after the close of the rainy season, when the operation was no longer useful. The fencing has not been completed; deer have done damage, and rats are now attacking the fleshy roots of the plants in the sowings of 1889.

III.—Banawara (Nitida).—10 acres.

Was begun in 1882 by sowing over 8 acres in lines, the natural forest being left in patches, and in the following year it was extended by 2 acres. The growth is particularly good in patches where the natural forest was left. Trees measure up to 18 feet in height with a girth of 10 inches, which for seven years is excellent. Generally the area is incompletely stocked. It had originally been heavily grazed over, and the soil of the opener parts was in bad condition and unsuited for plantation purposes. The result is blank places which cannot be stocked. The cost of this area of 10 acres was R676 up to 1888-89.

A new extension of 7 acres was made during the past rainy season. This, owing to the sowings having been conducted in July instead of in May, has not succeeded.

IV.—Herikere (Tainkal).—79 acres.

The first planting was done with nursery plants in 1879 over some 6 acres cleared in the previous year. It was extended by 5 acres in the following year, and was said to be doing well, though there was a difficulty in procuring labour. Two acres were added in 1881, and the 13 acres treated had so far cost R1,522. In 1882, 6 acres were cleared and sown in lines and 4 acres were treated without clearing, but this latter plot did not succeed, the young plants damping off; and it was cleared in the following year and treated together with 26 acres newly cleared. Other growth was allowed to spring up moderately. The new clearing was said to be fairly well stocked, and the whole plantation was found to measure 50 acres. For two years no extension was made, blanks were replenished and the plantation was weeded, the cost so far having been R4,317. Seven acres were stocked in 1886 by sowing *dal* and sandal in lines, and a ditch of 4 feet section with fence was made on two sides to keep out the deer. In 1887 and 1888 ten and twelve acres were added, partly by sowings and partly by transplantings from the lines of the previous years.

The site of the plantation is naturally sandal-producing, but it consisted of patches of forest with open grassy blanks. These latter have been very difficult to stock. They have been constantly replenished, and now, just when they were believed to be fully stocked, deer

have been allowed to enter the plantation and do considerable damage. The grassy open places, even if stocked, will grow but poor trees slowly. As it is, these hold the plants which the deer can most easily reach and they suffer most. The area is about two-thirds stocked, and the growth, though very good in places, is uneven. The failure of the 4 acres treated in 1882 without clearing may possibly have been due to the lines not having been carefully weeded of all grass during the rainy season. The shade and drip from the trees, had the young plants been kept clear of cover in immediate contact with them, would scarcely have caused them to disappear.

V.—Bakka (Atturu).— 23 acres.

Is situated in the Atturu Reserve, 2½ miles from Fraserpet. It was all sown in 1882, but, owing in the first instance to late sowings and to the constant depredations of deer which did much damage in spite of its being protected by a fence on two sides, it had to be constantly undergoing repairs till 1888, when it was burnt over. It was again burnt in the dry weather of 1889 and practically destroyed. The ditch and fence have been completed all round, and 18 acres were last year successfully restocked by sowings in lines of sandal and *dal*. It requires careful weeding in the rains along the lines *only*, so as to free the heads of the sandal.

VI.—Huralikal (Atturu).—16 acres.

Is situated in the Atturu Reserve, about a mile west of the Bakka plantation, on a gentle slope with a westerly aspect. The site was originally covered with lantana, with an upper mixed forest composed chiefly of *Anogeissus latifolia* and inferior teak, in a somewhat open condition. Lines 5 feet broad were cleared through the lantana and sandal seed was sown. The first results were fair, but the plants were drawn up too rapidly and were weakly. The same result was obtained on an extension made in the following year, and the lantana quickly closing in most of the frail plants were smothered. In 1882 a clean felling was made and 16 acres were sown with sandal. This was a complete success, but in the dry weather of 1889 fire entered it and three-fourths of the trees have been killed down. Root suckers are coming up, but will be difficult to weed. It would have been well to have grubbed out all the dead stems early in the rainy season. This may still be done with advantage probably next rains. An extension of 5 acres was made in 1889 and the sowings have come up well. In patches the upper cover of forest has been left, and in these the plants are equally strong and weeds less luxuriant. It is a curious fact that this plantation, though not fenced, was not damaged by deer, although only a mile distant from Bakka. It is believed to owe its immunity to a tiger which frequented it.

VII.—Gundadagundi.—29 acres.

This is an isolated plot of 29 acres near Fraserpet. It contained some natural sandal, and was generally covered with scrub and lantana. Its soil is gravelly and well drained. In 1881 nine acres were planted up with 1 to 2 feet high plants 8′ × 8′ and manured. Of these, 75 per cent. succeeded. An extension of six acres was sown i li nes in the next year 12 feet apart. The seed germinated, but cattle ate many of the plants do wn.

In 1884 a further extension of eight acres was treated in a similar way, and the old portion was weeded. The cost so far was R901 on 23 acres. Fig cuttings, *Grevillas*, and other plants were put out in 1885 to form shade.

The area was not extended till 1888, when six acres were acquired and sown up, and part of this was re-sown last rainy season. The young plants have come up well, and are too thick in continuous lines. It would have been preferable and cheaper to have sown in patches. The entire area has been fenced and the cost has been R1,362 or R47 per acre. It carries a three-fourths crop, and the growth is specially good where there is shade. In the open parts the trees are less healthy, and appear to have suffered from over-weeding done for the sake of young plants put out in blanks. Beyond judicious weedings in the monsoon only and protection from fire, which will always be a serious danger, nothing remains to be done.

VIII.—Holégeri.—5 acres.

Consists of two plots of three and two acres on the banks of the Cauvery River within the municipal limits of Fraserpet. These plots may be considered entirely experimental. The one was taken up in 1877 and by 1880 was reported to be stocked, but the soil is ill-drained and stiff, and the plants are not growing except on the higher ground under shade. The other plot has succeeded better, but has been over-weeded. They have cost nearly a thousand rupees, and are not worth the salary of a special man to look after them. They have been fenced and might continue to be protected and placed under the head Guard in charge of Gandadagundi. No further expenditure should be allowed for weeding.

IX.—Dubare.—2 acres.

This is a plot of 2 acres (out of 8 originally treated) which has failed. The failure is attributed to the ravages of deer. It has cost R967 and is now being planted up with teak.

X.—Maldare (S. Dubare).—7 acres.

This plantation was commenced in 1880 by the planting of five acres, with poor results. In 1881 the same area was sown in lines, and an extension failed, owing to the work not being done sufficiently early.

Again, in the following year the replenishing of blanks was carried out late. A new area of 4 acres was sown in lines with *dal* and sandal, but this was not successful, owing to want of weeding in the rains. In 1883 a new area of 7 acres was cleared and planted in pits, seed being sown at the same time. Labour was difficult to procure at the proper season. Cattle and deer over-ran the plantation, and the result was not satisfactory. In 1884 repairs were carried out, and the plantation entered as 12 acres had so far cost R1,889. It has been persevered with for the past five years, with the result that 7 acres are poorly stocked with sandal, say half a crop. The growth is not good. Blanks are being filled up with teak.

XI.—Balumani (Mawkal).—22 acres.

Was begun in 1880 by sowing in lines over a plot of 3 acres. This resulted in a good crop. In 1881 it was extended by 4 acres, a portion of which was not well drained. In 1882 a further extension of 5 acres was only moderately successful. In 1883 an addition of 10 acres was treated, and this did not come up well. From 1884 to 1887 attempts were made to complete the area, but with poor success. On the whole the area is not more than half-stocked. In parts the plants are growing well, particularly so round a large *Dalbergia latifolia.* Where grassy blanks existed and the soil was hardened and deteriorated, the trees are unhealthy and covered by lichens. Weedings have not been recently carried out, and as the forest growth fills in and completes itself, the conditions will become more favourable. The cost of the 22 acres is entered at R2,084.

XII.—Bambookadu (Tittimatti).—25 acres.

Is on the site of an abandoned coffee estate of 150 acres at Tittimatti. In 1884, 3 acres were cleared and sown in lines. The seed germinated, but the plants were allowed to be suppressed by weeds and some died off. In 1886, 8 acres were added. Deer, however, did much damage. Weedings were carried out late. In 1886 the sowings over 7 acres again failed, through want of proper weeding in time. In 1887 an extension of 7 acres was partly planted and partly sown.

A plot of 50 acres has been enclosed by ditch and fence to keep out deer, and a part of the 25 acres already treated was re-sown during the last rains. These sowings have succeeded. There is a sufficiency of plants, but they will require attention and careful weeding during the next rains. A mistake is made in not weeding during the rainy season, and then cutting down everything flush with the ground after the dry weather has set in. Of the 25 acres, half may be considered fully stocked. The cost to date has been R1,493, inclusive of the cost of fencing.

XIII.—Karmad (Hatgat).—15 acres.

The *Karmad* plantation commenced in 1880 was only partially successful, and was destroyed by fire in 1887. Attempts have been made to restore the area by sowing, but for two years these have failed. As the area is only separated from the teak plantations by a narrow belt of forest, it will be better to introduce teak and avoid further outlay on sandal; the cost has already been more than R2,000.

XIV.—Nagarholle (Nalkeri).—12 acres.

The *Nagarholle* plantation of 12 acres has cost nearly R200 per acre. It is about three-fourths stocked. In 1880 sowings were carried out over 6 acres, and this was extended by 3 acres in 1881, and by a further area of 3 acres in 1882. From 1883 to date it has been weeded, and blanks were replenished up to 1886. The largest tree in the plantation has a growth of 9 inches, with a total height of 25 feet. This specimen is growing through the crown of an old teak left. The general appearance of the plantation is that of an orange grove. The trees are much branched, often spreading at 2 feet from the ground. They girth from 6 to 14 inches, and have a general height of from 16 to 20 feet, but are on the whole not healthy. The plantation has been too thoroughly weeded, and the trees isolated each dry weather to the detriment of their healthy development.

APPENDIX C.

Statement showing the year of formation and cost to end of 1888-89 of the different Plantations.

Opening Year.	No.	Name of Plantation.	Cost up to end of 1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	Total Cost.	Total Acreage.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	Remarks.
			R	R	R	R	R	R							
1867-68	1	Karmad Teak Plantation	23,081	189	456	161	220	24,445	197	189	...	...	...	...	
1883-84	2	Irumani (Hatgat) Teak Plantation	277	23	16	22				8	...	...	...	...	
1868-69	3	Kutompolle Teak Plantation	26,991	3,468	4,622	4,548	2,966	42,595	453	231	30	82	80	30	
1872-73	4	Karepura "	1,981	....	...	...	...	1,981	14	14	...	...	...	...	
1867-68	5	Tittimatti "	875	106	81	98	117	1,277	24	24	...	...	...	...	
1879-80	6	Anekadu "	2,354	256	333	343	420	3,706	60	40	10	5	5	...	
1872-73	7	Amalle (Nalkeri) Teak Plantation	1,803	96	175	99	99	2,272	17	24	...	...	...	...	7 acres found short on measurement.
1879-80	8	Hanakodu (Dubare) Teak Plantation	497	30	57	160	136	2,171	28	10	...	...	2	8	
1880-81	9	Chirlikere (Dubare) Teak Plantation	1,146	40	105	...	...			6	...	2	...	...	
1881-82	10	Maldare Teak Plantation	452	48	50	240	229	1,019	18	10	...	...	5	3	
1883-84	11	Huralikal (Atturu) Teak Plantation	818	34	87	80	165	1,184	19	13	...	2	4	...	
1879-80	12	Mercara Fuel Reserve	9,421	80	387	447	613	10,948	125	85	...	20	10	10	
1872-73	13	Gangawara Sandal Reserve	8,231	685	734	771	1,196	11,617	121	80	10	7	12	12	
1877-78	14	Fraserpet-Holegeri "	881	...	4	3	21	909	5	5	...	...	...	...	
1881-82	15	Fraserpet-Gandadagundi Reserve	901	83	110	99	169	1,362	29	23	...	...	...	6	
1878-79	16	Herikeri Reserve	4,062	255	501	417	590	5,825	79	50	...	10	10	12	3 acres found short on measurement.
1880-81	17	Nagarholle (Nalkeri) Reserve	2,134	67	93	49	45	2,388	12	12	...	...	...	...	
1880-81	18	Balumani (Mawkal) "	1,757	96	74	59	98	2,084	22	22	...	...	...	...	
1880-81	19	Dubare (Bungalow) "	660	26	194	72	15	967	2	18	...	...	...	...	6 acres transferred.
1880-81	20	Kargodu (Malambi) "	897	48	91	179	263	1,478	27	12	...	...	7	8	
1882-83	21	Banawara (Nitida) "	568	14	27	16	51	676	10	10	...	...	...	...	
1880-81	22	Maldare (S. Dubare) Reserve	1,889	110	183	60	88	2,330	7	22	2	1	...	...	8 acres transferred to teak.
1882-83	23	Bakka (Atturu) Reserve	779	56	144	62	42	1,083	23	13	...	...	...	...	
1880-81	24	Huralikal (Atturu) Reserve	862	104	17	52	74	1,109	16	16	...	...	...	...	
1880-81	25	Karmad (Hatgat) Reserve	1,773	106	86	121	125	2,211	15	5	...	...	...	...	
1883-84	26	Yarekolly (Anekadu) Reserve	19	...	5	...	...	24	2	4	...	...	...	...	2 acres excluded.
1884-85	27	Bambookadu (Tittimatti) Reserve	86	191	356	406	454	1,493	25	3	8	7	7	...	
1887-88	28	Dubare Bamboo-died land	....	...	...	134	292	426	52	...	...	...	47	5	
1887-88	29	Maldare " "	...	...	—	27	60	87	20	...	...	...	20	...	
1888-89	30	Mawkal " "	...	...	...	...	32	32	6	...	...	...	...	6	
		Total	95,195	6,211	8,988	8,725	8,580	1,27,699	1,428	949	60	136	209	100	

APPENDIX D.

Timber sold in Forest Depôts, Coorg, during the past five years.

Name of Depôt.	Year.	Teak logs.			Sawn teak logs.			Teak scantlings.			Honne logs.			Other wood logs.			Teak poles.		Other wood poles.		Bamboos.		Total Amount.
		No.	C. ft.	Amount.	No.	C. ft.	Amount.	No.	C. ft.	Amount.	No.	C. ft.	Amount.	No.	C. ft.	Amount.	No.	Amount.	No.	Amount.	No.	Amount.	
				R			R			R			R			R		R		R		R	R
Hunsur Depôt	1884-85	1,056	26,110	28,814	...	...	...	...	...	...	219	4,998	3,817	62	1,153	553	...	...	...	...	...	...	33,183
	1885-86	828	21,212	19,013	...	...	...	...	...	...	133	3,238	3,528	203	4,543	1,266	60	23	...	...	800	19	23,849
	1886-87	670	13,478	11,591	14	644	543	308	2,313	2,209	457	10,984	7,668	350	7,827	3,591	...	...	...	...	...	...	25,603
	1887-88	1,576	48,532	44,770	221	932	1,106	471	3,525	3,564	488	12,118	7,509	529	13,762	4,719	231	193	...	...	...	...	61,860
	1888-89	822	22,410	19,854	20	523	480	1,314	3,102	2,871	506	14,334	10,958	677	18,866	8,819	508	176	...	...	...	...	43,158
	Total	5,046	131,742	1,24,042	255	2,199	2,129	2,093	8,940	8,644	1,803	45,670	33,480	1,821	46,151	18,948	799	392	...	...	800	19	1,87,653
Fraserpet Depôt (in Coorg).	1884-85	221	3,125	2,181	...	...	...	...	...	...	264	5,146	2,644	194	3,598	1,475	99	60	180	129	15,469	466	6,956
	1885-86	264	3,272	2,206	...	...	...	...	...	...	69	1,599	2,136	312	5,340	1,783	14	10	35	17	5,887	157	6,306
	1886-87	172	4,074	2,249	...	...	...	...	...	...	240	5,437	2,487	156	2,947	1,005	...	...	...	...	1,013	24	5,765
	1887-88	123	2,904	2,054	...	...	...	...	...	...	351	7,932	4,425	243	5,172	1,505	...	...	...	...	...	...	7,985
	1888-89	146	1,807	968	...	...	...	32	100	48	306	6,767	2,879	85	1,981	782	...	...	...	...	...	...	4,676
	Total	932	15,182	9,658	...	...	...	32	100	48	1,230	26,881	14,571	990	19,038	6,550	113	70	215	146	22,369	647	31,690
Do. (Across the boundary)	1884-85	87	1,814	1,680	...	...	...	...	...	...	26	396	191	30	428	165	...	...	...	...	...	...	2,016
	1885-86	81	318	129	...	...	...	...	...	...	2	46	29	1	11	4	...	...	...	...	...	...	162
	1886-87	10	176	168	...	...	...	...	...	...	16	295	140	21	306	119	...	...	...	...	...	...	428
	1887-88	22	405	337	...	...	...	...	...	...	30	361	289	18	245	168	...	...	...	...	...	...	794
	1888-89	10	208	156	...	...	...	...	...	...	33	614	226	26	394	130	...	...	...	...	...	...	511
	Total	210	2,921	2,450	...	...	...	...	...	...	107	1,702	875	96	1,384	586	...	...	...	...	...	...	3,911
Mercara Depôt	1884-85	7	211	161	...	...	...	...	...	...	10	216	142	39	772	241	...	...	...	...	5	...	545
	1885-86	1	26	32	...	...	...	...	...	...	48	1,005	560	2	45	23	...	...	...	...	...	...	615
	1886-87	1	23	22	...	...	...	...	...	...	29	816	516	6	107	65	...	...	...	...	...	...	603
	1887-88	5	129	54	...	...	...	...	...	...	126	2,477	939	64	1,330	571	...	...	...	...	...	...	1,563
	1888-89	...	...	...	...	...	...	...	...	...	44	1,149	792	28	661	306	...	...	...	...	...	...	1,099
	Total	14	389	269	...	...	...	...	...	...	257	5,663	2,949	139	2,915	1,206	...	...	...	...	5	...	4,425
Tittimatti Depôt (now closed).	1884-85	36	548	392	...	...	...	...	...	...	22	338	180	16	198	75	...	...	1,352	1,043	...	...	1,690
	1885-86	...	...	...	...	...	...	...	...	...	8	286	140	2	41	16	...	...	521	337	...	...	494
	Total	36	548	392	...	...	...	...	...	...	30	624	320	18	239	91	...	...	1,873	1,380	...	...	2,184
Bakka Depôt (now closed).	1884-85	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15,258	370	370
	1885-86	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7,382	150	150
	1886-87	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10,025	202	202
	Total	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	32,645	722	722
Arkalgôd Depôt	1884-85	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	1885-86	...	...	...	...	...	...	...	...	...	22	364	209	61	1,052	480	...	...	...	...	...	...	688
	1886-87	4	28	24	...	...	...	...	...	...	20	293	161	16	252	133	...	...	...	...	...	...	318
	1887-88	14	112	98	...	...	...	...	...	...	40	552	286	16	278	200	...	...	...	...	...	...	566
	1888-89	85	665	338	...	...	...	...	...	...	118	1,913	1,136	135	1,847	925	...	...	...	...	...	...	2,399
	Total	103	805	460	...	...	...	...	...	...	200	3,122	1,772	228	3,429	1,738	...	...	...	...	...	...	3,970

APPENDIX E.

Average annual outturn of Timber from each Forest in Coorg during the past five years.

Name of Forest.	Teak logs.		Sawn teak logs.		Teak scantlings.		Honné.		Other woods.		Teak poles.	Other wood poles.	Bamboos.
	No.	C. ft.	No.	C. ft.	No.	C. ft.	No.	C. ft.	No.	C. ft.			
Nalkeri . . .	750	20,553	150	1,160	270	1,593	141	3,631	280	7,022	...	...	...
Maldaré . . .	8	161	...	...	...	...	79	1,701	49	864	...	69	...
Arkeri . . .	23	461	...	...	...	...	89	1,746	39	731	...	333	...
Mawkal . . .	36	767	...	...	...	...	113	2,686	122	2,654	...	205	...
Hatgat . . .	334	10,978	...	...	...	...	136	3,488	156	3,927	...	3	...
Dubaré . . .	43	597	...	...	...	...	87	1,900	45	827	...	1	...
Anekadu . .	56	923	...	...	...	...	34	866	8	156	7	...	7,822
Yedavanad . .	53	1,288	...	...	...	...	168	4,276	173	4,058	33	15	245
Ganagur . .	...	...	...	...	...	...	7	110	18	298	...	...	...
Atturu . . .	477	7,260	...	...	...	...	20	545	22	539	...	64	...
Jeinkal . . .	50	476	...	...	...	...	3	87	2	33	...	...	...
Yelsavirshumé .	21	161	...	...	...	...	50	927	36	722	...	...	...
Baetancote . .	...	5	...	...	...	...	39	824	37	736	...	...	...
Gadiuad . . .	1	19	...	...	...	...	5	132	3	51	...	...	...
Gangwara . .	...	...	...	...	...	...	1	38	4	53	...	...	...
Nalloor . . .	...	...	...	...	...	...	32	968	8	259	...	...	...
Hosally . . .	14	[illegible]	...	...	...	...	6	165	1	13	...	...	...

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